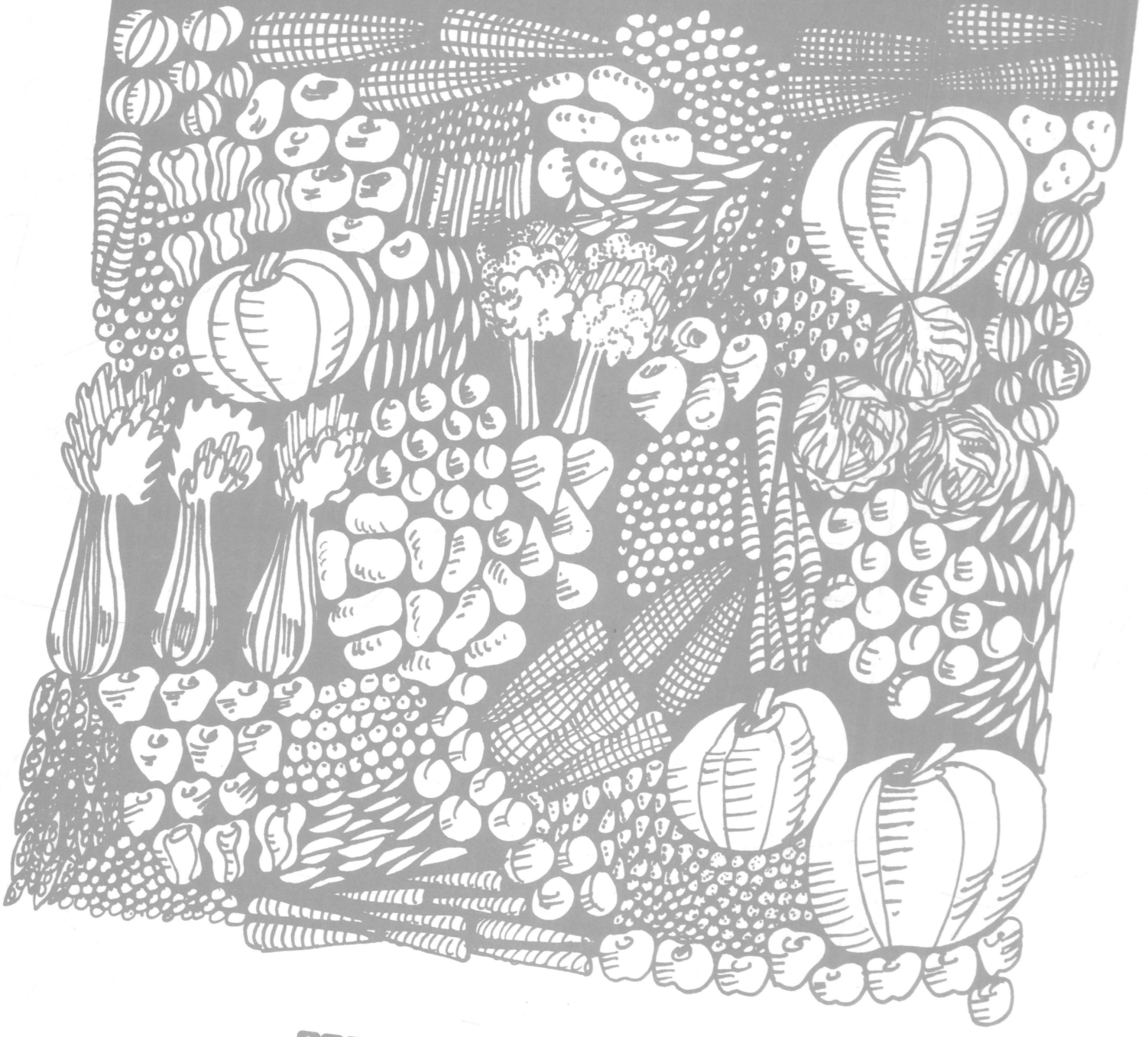
PESTICIDE USE ON FRUIT AND VEGETABLE CROPS IN OHIO 1983



OCES Ohio Cooperative Extension Service
The Ohio State University

Prepared by

Ohio Pesticide Impact Assessment Program

Acie C. Waldron
State PIAP Liaison Coordinator
The Ohio State University

Robert L. Curtner
Technical Assistant
Ohio Cooperative Extension Service
The Ohio State University

Bruce A. Fingerhut
Technical Assistant
Ohio Agricultural Research and Development Center
The Ohio State University

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PESTICIDE USE ON FRUIT AND VEGETABLE CROPS IN OHIO 1983

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SUMMARY

Fungicides on Fruit Crops

About 369,200 pounds of fungicide active ingredient were applied in 217,000 acre treatments to fruit crops in Ohio during 1983. (Acre treatment is the acres of crop treated multiplied by the number of times that acreage was treated with the same pesticide during the year.) Over 76 percent of that total quantity (281,841 pounds) was used in apple production with metiram (95,084 pounds), captan (57,239 pounds), mancozeb (56,221 pounds), sulfur (23,623 pounds) and dodine (18,678 pounds) constituting the major usage reported. In addition to the captan used on apples, 12,725 pounds were used on 5,273 acre treatments of strawberries, 8,275 pounds on 4,532 acre treatments of peaches, 6,853 pounds on 4,493 acre treatments of grapes, 2,434 pounds on 1,048 acre treatments of raspberries and less than 800 pounds each on plums and cherries. Ferbam was the fungicide used in the largest quantity (9,146 pounds) on grapes, sulfur (12,113 pounds) on peaches and lime sulfur (9,033 pounds) on raspberries. Scab was the major disease problem reported by three fruit growers. Almost 76 percent of the growers reported that disease control programs were satisfactory or better.

Herbicides on Fruit Crops

Forty-six percent of the fruit crop acreage was treated for weed control in 1983 with a total of 19,283 pounds applied to 8,262 acres in 9,217 acre treatments. Simazine was the herbicide used in the largest quantity with 4,160 pounds of the total 5,150 reported used on apples.

Insecticides on Fruit Crops

About 243,500 pounds of insecticides and 25,800 gallons of oil were applied to fruit crops, with approximately 79 percent of the insecticides and 99 percent of the oil applied to apple crop acreage. Almost 94,475 pounds of phosmet in 62,080 acre treatments, 28,644 pounds of azinphosmethyl in 34,245 acre treatments and 21,120 pounds of carbaryl in 12,827 acre treatments were applied to apples, plus lesser amounts of several other insecticides. Carbaryl was applied in 7,295 acre treatments of grapes, totaling 13,629 pounds, and 3,260 pounds were applied in 1,688 acre treatments of strawberries.

Phosmet also was applied to significant acreages of peaches, pears and cherries. Reports indicated that codling moth and mites were the two most common insect problems for which insecticides were applied and that control was satisfactory or better.

Fungicides on Vegetable Crops

About 220,500 pounds of fungicides were used on 149,000 acre treatments of vegetables, with over 37.7 percent of that poundage applied to tomatoes and 30.3 percent to potatoes. The four major fungicides used, constituting 88 percent of the total usage, in descending order of quantity were mancozeb—66,222 pounds, maneb—57,918 pounds, chlorothalonil—36,797 pounds and copper—33,042 pounds. Approximately 45 percent of the mancozeb used in the state in 1983 on vegetable crops was applied to tomatoes and 50 percent of the total was applied to potatoes. Mancozeb and maneb accounted for almost all of the fungicides applied to potatoes. Copper and chlorothalonil were used on slightly more tomato acreage than was mancozeb. Copper was the major fungicide used on cabbage, chlorothalonil on cucumbers, captafol and metiram on peppers and squash, and maneb on onions and sweet corn. Growers reported several disease concerns for which fungicides were applied and generally felt that the disease control programs were satisfactory or better.

Herbicides on Vegetables

Herbicide use on vegetable crops in Ohio in 1983 amounted to about 52,400 pounds applied to 34,350 acre treatments. The major uses were 5,000 pounds of naptalam for weed control in cucumbers; 8,349 pounds of EPTC, 1,806 pounds of glyphosate and 1,712 pounds of linuron in potatoes; 4,368 pounds of chloramben in squash plus 1,453, 2,451 and 2,821 pounds in green beans, pumpkins and tomatoes, respectively; 2,348 pounds of metribuzin and 2,009 pounds of trifluralin in tomatoes; 3,325 pounds of cyanazine, 2,839 pounds of butylate and 1,777 pounds of atrazine in sweet corn; and 1,933 pounds of CDAA and 1,657 pounds of chlorpropham in onions. Smaller amounts of several herbicides were used in a variety of vegetable crops. Major weed concerns were reported as general weed, broadleaf and grass weed control and the effectiveness was satisfactory or above.

Insecticides on Vegetables

In excess of 419,250 pounds of insecticides were applied to 340,630 acre treatments of vegetable crops in 1983. About 52.7 percent of that amount was applied to tomatoes, 20.1 percent to potatoes and 10.4 percent to sweet corn. Over 63.5 percent (266,604 pounds) of the total insecticide poundage reported was attributed to carbaryl usage, with 198,723 pounds of that applied on tomatoes, 20,767 on potatoes, 16,924 on sweet corn, 12,417 on cucumbers and 12,000 on carrots. Aldicarb (19,603 pounds), methamidophos (11,898 pounds) and fonofos (9,204 pounds), along with carbaryl, were the major insecticides used on potatoes. Bacillus thuringiensis was used mainly on cabbage—5,283 pounds, cauliflower—3,469 pounds, celery—2,727 pounds and tomatoes—4,809 pounds. In addition to carbaryl, methomyl—9,453 pounds, methyl parathion—6,247 pounds and parathion—5,111 pounds had extensive use in sweet corn production. Endosulfan had the largest use for insect control on cucumbers (3,125 pounds), pumpkins (2,549 pounds), squash (3,459 pounds) and tomatoes (4,259 pounds) on significant acre treatments. Nearly 2,460 pounds of acephate were used on peppers and 9,600 pounds of methamidophos were used on tomatoes. Significant quantities of several other insecticides were used on a variety of vegetable crops. A variety of insect problems were reported, generally quite specific for crop variety, with the effectiveness of control programs rated good to excellent.

Pesticide Application

Fruit and vegetable growers self-applied the vast majority of pesticide chemicals to their crops with ground equipment and in dilute sprays. More than 91 percent of the growers who applied pesticides were certified applicators. Most of the growers who reported used acceptable practices in storing pesticides and disposing of wastes. The utilization of protective clothing and equipment has improved during the 1977 to 1983 interval, but much still needs to be done by those involved in pesticide operations to ensure personal safety.

Trends in Pesticide Use

Comparison of the data in this 1983 survey with those of 1977, 1978 and 1979 indicate a more intense current crop protection program with the use of larger quantities of pesticides per treatment and more applications per year than in the past. Several pesticides have been phased out since 1977 and new ones have become of more common use. However, in spite of recent developments in new biological and chemical control agents, growers still seem to prefer materials that have proved effective in the past.

INTRODUCTION

Fruit and vegetable production in Ohio constitutes a minor percentage of the total crop acreage but adds a significant contribution to the total crop income. In 1983, 18,650 acres of fresh market vegetables (sweet corn, celery, lettuce, onions and tomatoes); 20,400 acres of processed vegetables (tomatoes, snap beans and carrots); 10,400 acres of potatoes; 11,071 acres of apples and peaches; 1,900 acres of strawberries and 3,067 acres of grapes accounted for only about 0.7 percent of the Ohio Crop Reporting Service (OCRS) reported crop acreage, but the $149.5 million of receipts accounted for 4.1 percent of the total farm income.[1,2] These figures do not include the additional 6,000 acres of cucumbers and 2,800 acres of cabbage grown for fresh market and processing and the estimated 7,500 acres of other fruits and vegetables. The production of fruits and vegetables in Ohio is dependent on adequate pest control measures, many of which involve chemical pesticides. The continued use of effective pesticides requires current knowledge of the extent of use and the subsequent importance of retaining the registration. Loss of registration of essential pesticides could have a detrimental effect on the production of minor crops in Ohio.

Pesticide use surveys were conducted for Ohio fresh market vegetable crops in 1977[3], processing vegetable crops in 1979[4] and tree fruit crops in 1978.[5] It was determined that pesticide use surveys should be updated on a four to five year schedule. Such a schedule should show changes and trends in pesticide use and could be supplemented with yearly input from Extension specialists and the OCRS as the need arises. Experience in past years has shown that pesticide use survey data has been very useful to the agricultural industries, governmental agencies, and university and Extension personnel. Surveys have also been very important in documenting the use and necessity of certain pesticides as an aid in retaining essential registrations.

PROCEDURES

Rather than conduct separate survey programs for fresh market vegetables, processing vegetables, tree fruits, small fruits and grapes, partly because the different survey questionnaires may go to some of the same people, the survey questionnaire was expanded from that of past years to provide answers on all fruits and vegetables that might be included in the grower's operations (see Appendix 1).

The questionnaire recipients were selected from the commercial and private applicator certification lists for the categories of fruits and vegetable production provided by the Ohio Department of Agriculture, the clientele list of fruit and vegetable growers of the Ohio Crop Reporting Service, and the listing of appropriate commercial companies, etc., that contracted for processing crop production. The lists were separated by county and selections were made in a random fashion from each county. The selection was weighted so that a greater number of responses could be obtained from those counties of more intensive fruit and vegetable production. Initially, 1,200 survey questionnaires were mailed to recipients chosen from the listings, including the 12 known processors. A second mailing of 300 questionnaires was sent to selected individuals in counties that did not provide adequate response to the first mailing and to remind processors who had not responded earlier.

RESULTS AND DISCUSSION

General

About 10 percent of the questionnaires were returned with reliable, usable information, including questionnaires from five processors. The number of commodity growers responding and the percent of the state acreage included in the responses are shown in Table 1. For commodities for which no estimated harvested acreages are available, the totals are calculated on the basis of the 1977-79 acreages and estimates of Extension specialists. For the most part, the response relative to percent of estimated total crop acreage harvested is satisfactory to calculate state totals for pesticide use; the major exceptions being cucumbers, lettuce, peas and possibly celery. The extrapolation of some data is complicated further by the responses of only one grower each for carrots, celery, eggplant, lettuce, onions and peas and only two for greens and squash. However, the one grower reporting for each accounted for 100 percent of the estimated acreage for carrots, 4.4 percent of the celery, 13.5 percent of the eggplant and 6.7 percent of the onion. The two growers reporting for each accounted for 64 percent of the greens and 15 percent of the squash.

The acreages of individual fruit and vegetable crops that were treated with specific pesticides in 1983 are shown in tables 2 and 5, respectively. Also shown is the total acreage over which that pesticide was applied. Tables 3 and 6 show the acre treatments (the acres of crop treated multiplied by the number of times that acreage was treated with the same pesticide during the year) by fruit and vegetable crop and specific pesticides and the total acre treatments for each crop with all pesticides plus the total acre treatments for all crops for each pesticide. Tables 4 and 7, respectively, indicate the total poundage of specific pesticide active ingredient applied to each fruit and vegetable crop, the total of all pesticides applied to each crop and the total of each pesticide applied to all fruit or vegetable crops. The percent acreages of each crop treated with specific pesticides can be ascertained by comparing the data in tables 2 and 5 with the total crop acreages in Table 1.

Pesticides are referred to and identified throughout the text by their common names. A cross reference to pesticide trade names for the common names used in this text is provided in Appendix 2. Unless indicated otherwise, reported values are extrapolated to state totals and are for the pesticide active ingredient quantity.

[1] Ohio Agricultural Statistics—1983. Ohio Crop Reporting Service. Agdex 100/850. August 1984.

[2] 1983 Ohio Farm Income. Department Series E.S.O. 1134. Ohio Agricultural Research and Development Center. October 1984.

[3] "Pesticide Use on Field Grown Fresh Market Vegetable Crops in Ohio—1977." Ohio Cooperative Extension Service Bulletin 648. May 1979.

[4] "Pesticide Use on Vegetable Crops for Processing in Ohio—1979." OCES/OARDC Bulletin 701/1152. Agdex 250/606. January 1983.

[5] "Pesticide Use on Selected Deciduous Tree Fruit Crops, Ohio, 1978." OCES/OARDC Bulletin 696/1145. Agdex 210/608. May 1982.

Fungicides on Fruit Crops

Tables 2 and 3 show that four fungicides (benomyl, captan, dodine and metiram) accounted for about 62 percent of the fruit acreage treated and 68 percent of the acre treatments, respectively. Approximately 72 percent of those acreages and 80 percent of the related acre treatments treated with the four fungicides were attributed to apple production. In fact, apple production accounted for 69 percent and 80 percent of the fruit acres and acre treatments, respectively, treated with fungicides. Captan was used on more acres of fruit crops than any other fungicide (with 52 percent of those acres attributed to apples) followed by benomyl (62 percent), metiram (100 percent) and dodine (98 percent). Captan was also the most commonly used fungicide for grape, peach, plum and raspberry production and ranked second in cherry and strawberry production (Table 2) relative to acres treated. However, for acre treatments, benomyl surpassed captan use in cherry and raspberry production and ferbam use in grape production (Table 3).

Based on total quantity of fungicides used on fruit crops (Table 4), four chemicals accounted for about 75.8 percent of the 369,237 pounds applied. These were captan—24.1 percent, mancozeb—15.7 percent, metiram—25.8 percent and sulfur—10.2 percent (with lime sulfur accounting for another 3.6 percent). The apple crop received 64.5 percent of the captan applied, 96.6 percent of the mancozeb, 100 percent of the metiram and 61 percent of the sulfur. Lime sulfur was applied to grapes and raspberries. These four chemicals plus dodine (18,678 pounds) accounted for 87.4 percent of the fungicides applied to apples in 1983. Captan was the fungicide used in the largest quantity for cherry, plum and strawberry production and the second most used on grapes, peaches and raspberries. Ferbam was used in the greatest quantity on grapes, sulfur on peaches and pears, and lime sulfur on raspberries. Chlorothalonil was the fungicide of choice in melon production.

Herbicides on Fruit Crops

A total of 19,283 pounds of herbicides were applied to 8,262 acres and 9,166 acre treatments of fruit crops (tables 4, 2 and 3). Simazine, followed by napropamide, oryzalin and diuron, were the herbicides used in the greatest quantity. About 46 percent of the fruit crop acreage was treated for weed control in 1983, but except for blueberries and raspberries, no listed herbicide was applied to more than about 36 percent of any crop acreage.

Insecticides on Fruit Crops

About 243,500 pounds of insecticides and 25,800 gallons of oil were applied to fruit crops in Ohio in 1983 (Table 4). Approximately 79 percent of the insecticides and 99 percent of the oil were applied to apple crop acreage. Grapes recceived the second highest quantity of insecticides (10.7 percent of the total fruit crop usage), followed in descending order by pears (3.2 percent), peaches (2.9 percent) and strawberries (2.2 percent). A similar comparison was also observed for the crop acre treatments, with 79 percent for apples, 9.7 percent for grapes, 2.8 percent for pears, 4.9 percent for peaches and 1.8 percent for strawberries (Table 3). Phosmet was the insecticide used in the largest quantity and on the most fruit acreage, with 42.7 percent of the total poundage (92.2 percent of this total applied to apples) applied to 30.3 percent of the total acre treatments (tables 4 and 3). Phosmet was applied to 81.7 percent of the apple acreage (Table 2) and 35.5 percent of the acre treatments (Table 3) and accounted for 49.7 percent of the total insecticide poundage thus applied (Table 4).

In descending order, azinphosmethyl was applied to 50.4 percent and 19.6 percent of the apple acreage and acre treatments, respectively, accounting for 15.1 percent of the total insecticide usage; cyhexatin—28.3, 8.7 and 2.8 percent; endosulfan—21.2, 3.1 and 4.2 percent; carbaryl—17.6, 7.3 and 11.1 percent; ethion—11.0, 1.9 and 1.2 percent; oxamyl—11.0, 1.7 and 0.9 percent; methomyl—7.3, 3.9 and 2.5 percent; phosalone—6.1, 3.7 and 5.1 percent; fenvalerate—5.1, 3.7 and 1.0 percent; methyl parathion—4.7, 2.7 and 1.3 percent; parathion—3.6, 2.0 and 1.0 percent; and diazinon—1.8, 0.6 and 1.6 percent. Other insecticides were used in less significant acreages and quantities. Oil was applied to 39.7 percent of the acreage (Table 2).

Carbaryl and parathion were the predominant insecticides used on grapes (Table 2). Carbaryl accounted for 52.9 percent of the total poundage used on 34.0 percent of the total acre treatments, while parathion accounted for 9.6 percent and 21.5 percent, respectively (Table 4). Azinphosmethyl accounted for 13.1 percent of the total usage on 13.2 percent of the acre treatments and methoxychlor for 9.9 percent of the usage on 6.2 percent of the acre treatments. Dicofol was used on 9.9 percent of the acre treatments, although the poundage used on grapes accounted for only 2.9 percent of the total insecticide usage. Azinphosmethyl and phosmet were used on 44.8 percent and 12.2 percent, respectively, of the insecticide treated peach acreage, and 39.5 percent and 12.5 percent of the acre treatments, but constituted 31.6 percent and 33 percent, respectively, of the total insecticide usage. Phosmet, dicofol and permethrin were the major insecticides used on pears. Phosmet constituted over 73 percent of the insecticide use on plums. Carbaryl use amounted to 61 percent of the insecticide poundage used for insect control on strawberries, and an additional 14.3 percent was attributed to endosulfan use and slightly in excess of 8.0 percent each for azinphosmethyl, dicofol and malathion (Table 4).

Fungicides on Vegetable Crops

About 220,500 pounds of fungicides were used on 149,100 acre treatments of vegetables. Over 37.7 percent of that poundage was applied to tomatoes and 30.3 percent to potatoes, 11.9 percent to cucumbers, 5.2 percent to cabbage, 4.7 percent to peppers, 4.7 percent to squash and 2.3 percent to corn (Table 7).

Mancozeb was the fungicide used most on tomatoes (29,824 pounds or 45 percent of the total state usage for vegetable crops), but was used on less acreage and acre treatments than copper — 22,658 pounds on 4,746 acres and 16,605 acre treatments (Tables 5 and 6). Approximately 17,950 pounds of chlorothalonil, constituting 48.8 percent of the state total vegetable crop usage, was applied to 2,752 acres of tomatoes in 15,489 acre treatments. The balance of the chlorothalonil, 45.7 percent and 5.5 percent of the state total, was applied to 48.6 percent of the cucumber acreage and 23.5 percent of the pumpkin acreage, respectively. Over 52.7 percent of the captafol used on vegetables was applied to tomatoes, with the balance applied to squash (24.5 percent) and peppers (22.8 percent).

About 57.4 percent of the maneb and 49.9 percent of the mancozeb used on vegetable crops in the state were applied to potatoes. These two chemicals accounted for 99.3 percent of all fungicides used on potatoes and were applied in 24,140 and 20,640 acre treatments, respectively (tables 5, 6 and 7). The remaining 5.8 percent of the mancozeb poundage was applied to cucumbers and the balance of the maneb to cucumbers—10.4 percent, sweet corn—8.7 percent, onions—7.6 percent and cabbage—7.3 percent. Copper was the major fungicide used on cabbage, with 7,279 pounds applied to 40.7 percent of the acreage in 7,206 acre treatments. Over 57.4

percent of the metiram applied was used on 98.7 percent of the squash acreage in 3,549 acre treatments and the balance applied to 98.6 percent of the pepper acreage in 3,205 acre treatments.

Herbicides on Vegetable Crops

Potatoes, sweet corn and tomatoes were the three vegetable crops receiving the majority of herbicide application for weed control. Approximately 14,900 pounds of herbicides were applied to 7,232 acre treatments of potatoes, constituting 28.4 percent of the total applied by vegetable growers. Sweet corn growers applied 19.6 percent of the total herbicide poundage to 6,714 acre treatments, and 16.2 percent was applied to tomatoes in 9,699 acre treatments. Herbicide usage on cucumbers accounted for 9.5 percent of the state vegetable total, with another 8.3 percent attributed to squash and 7.9 percent to onions. All of the reported cucumber herbicide use was accounted to naptalam.

EPTC was the major herbicide used on potatoes with 8,349 pounds applied to 1,731 acres. More than 1,800 pounds of glyphosate were applied to 645 acres of potatoes, 1,712 pounds of linuron to 1,269 acres, 1,161 pounds of alachlor to 581 acres and 918 pounds of metribuzin to 1,247 acres. Cyanazine and butylate accounted for 59.9 percent of the herbicide use on sweet corn, 2,535 and 660 acres, respectively, and on 60 percent of the acre treatments. Almost 1,800 pounds of atrazine were applied to 1,497 acres of sweet corn, 1,220 pounds of alachlor to 610 acres but 1,393 acre treatments, and 1,132 pounds of metolachlor to 629 acres. Although metribuzin was applied to more acreage and acre treatments of tomatoes (63 percent of the latter), the herbicide used in the greatest quantity was chloramben, accounting for 33.3 percent of the total with metribuzin at 2.7 percent and trifluralin at 23.7 percent (tables 5, 6 and 7).

Metribuzin was applied to more acres of vegetable crops than any other herbicide, with 76.6 percent of that acreage being tomatoes, but only accounted for 6.2 percent of the total herbicides used. On the other hand, 11,093 pounds of chloramben (21.2 percent of the total herbicide poundage applied) were applied to squash, tomatoes, pumpkins and green beans, with squash receiving 39.4 percent of the total quantity in about five applications on 100 percent of the acreage (tables 1, 5, 6 and 7). All of the naptalam reported used was applied to about 27.8 percent of the cucumber acreage. All of the CDAA, chlorpropham and sethoxydim reported was used on onions being applied to about 100 percent of that acreage.

Insecticides on Vegetable Crops

About 52.7 percent of the quantity of insecticides applied to vegetable crops in Ohio in 1983 was used on tomatoes, 20.1 percent for potatoes, 10.4 percent for sweet corn, 3.7 percent for cucumbers, 3.0 percent for cabbage and 2.9 percent for carrots on 126,906, 63,856, 69,025, 16,667, 24,940 and 6,050 acre treatments, respectively (tables 5, 6 and 7). Carbaryl was applied to over 3.3 times the amount of total acreage than the next most used chemical, methomyl, and was applied to 44 percent of the total acre treatments. Carbaryl accounted for 89.9 percent of the quantity of insecticides applied to tomatoes, 24.7 percent applied to potatoes, 39 percent applied to sweet corn, 80 percent applied to cucumbers, 99.8 percent applied to carrots, 61.3 percent applied to pumpkins, and 100 percent applied to eggplant and green beans. It was applied to 94.9 percent of the planted tomato acreage, 57.4 percent of the potato acreage, 35.3 percent of the sweet corn acreage, 100 percent of the cucumber and carrot acreages, and 24.1 percent of the green bean acreage (tables 1 and 5).

Methomyl, methamidophos, B.T. and endosulfan constituted almost all the remaining insecticide use on tomatoes that was not attributed to carbaryl. Aldicarb was used on more acres of potatoes (64.5 percent of the total planted) than any other insecticide, but was second to carbaryl in quantity applied (19,603 pounds vs. 20,767 pounds; Table 7.) Approximately 11,900 pounds of methamidophos and 9,200 pounds of fonofos were applied to potatoes in 13,753 and 2,301 acre treatments, respectively. Almost all of the permethrin, fonofos, dimethoate, oxamyl, phorate and phosmet, and over 62 percent of the diazinon and 93 percent of the carbofuran reported used on vegetable crops in Ohio were applied to potatoes.

About 31.2 percent of the B.T. used on vegetable crops in Ohio in 1983 was applied to cabbage, followed by 28.4 percent to tomatoes, 20.4 percent to cauliflower and 16.1 percent to celery. On a quantity basis, B.T. ranked fourth in total vegetable crop usage (Table 7) but not on acreage and acre treatments. Endosulfan was used on squash, cucumbers, pumpkins and peppers in addition to tomatoes. The major use for methomyl was on sweet corn where 73.3 percent of the total vegetable crop usage was reported on 34.2 percent of the sweet corn acreage. Other insecticides used in significant quantities and acreages for insect control on sweet corn were ethyl and methyl parathion, oxydemeton-methyl, and fenvalerate; in fact, all of the methyl parathion use reported and 37.7 percent of the ethyl parathion was for sweet corn. The only use reported for acephate was on peppers.

Methods of Pesticide Application

Fruit and vegetable growers self-applied the vast majority of pesticide chemicals to their crops. Growers made extensive use of ground equipment to apply dilute sprays in a broadcast pattern (Table 8). However, a significant percentage of fruit crops were treated by band application, which is in keeping with the nature of the plantings. The limited application made by commercial enterprises was most notable on vegetable crops. A considerable percentage of the survey participants did not respond to the question.

Major Pest Problems for Which Pesticides Were Applied

The major disease problems for which fungicides were applied to fruits and vegetables are listed in tables 9, 10 and 11. The range in the reported number of applications and the rate applied per acre is also indicated. Although a significant percentage of the respondents did not specify the disease for which the fungicide was used, it appeared that blights and rots were of major concern for the majority of vegetable growers and scab for the tree fruit growers. However, several disease problem concerns were reported; thus, the data includes all responses.

Tables 12 and 13 show that most growers reported the use of herbicides for broadleaf and grass weed control rather than designating any particular weed species problem. A large percentage reported herbicide use without specifying the target weeds.

Major insect problems and the related insecticide use reported by fruit and vegetable growers are indicated in tables 14, 15 and 16. It is difficult to determine the most significant pests encountered for each crop. However, pests most often reported were the Colorado potato beetle, flea beetle and leafhopper on potatoes; the corn earworm and European corn

borer on sweet corn; and aphids, codling moths and mites on tree fruits.

Personnel Practices in Pesticide Use and Management

More than 91 percent of the fruit and vegetable growers who applied pesticides are certified applicators (Table 17). Of those who were involved in pesticide operations, 76.1 percent were involved in all aspects of mixing/loading and applying (Table 18), particularly when there were three or fewer pesticide operators on the farm (Table 19). Where more than three operators were involved, the division of labor related to pesticide use was more pronounced. Table 20 shows that 86.3 percent of the growers used their own facilities for applying pesticides and did not use any commercial application services. About 2.7 percent of the growers depended exclusively on commercial companies to apply the pesticides. Only 6.7 percent of the greenhouse operators had facilities equipped for steam sterilization (Table 21).

More than 52 percent of the growers stored pesticides in a separate, exclusive building. Half of those who stored pesticides in buildings that housed other materials provided a barrier between the pesticides and the other materials (Table 22). However, only a low percentage of the storage facilities appeared to meet the requirements for fire protection, temperature control and drainage. Only 45.1 percent of the growers kept pesticides in locked storage facilities, and only 34.5 percent restricted access to pesticide storage areas to authorized personnel.

On a positive note, fewer than 1.0 percent stored any pesticide in other than the original container. More than 97 percent of the growers stored surplus pesticides for use during the next year or growing season, while 15.5 percent of the growers also returned surplus pesticides to the dealer, and/or 11.8 percent used the surplus pesticide for some other labeled use (Table 23). Those who disposed of surplus pesticides in other manners appeared to follow authorized procedures. For the most part, it appeared that growers followed recommended and safe practices in empty pesticide container disposal (Table 24). The major discrepancy would be the 3.4 percent of growers who permitted accumulation of containers on the premises and/or reused the containers for other purposes.

Fruit and vegetable growers used the Cooperative Extension Service as the major source for pest control information (Table 25), with 64.2 percent reporting that organization as the primary source of information and 24 percent as the secondary source. Growers also relied to a great extent on their own experience, chemical sales representatives and the state Department of Agriculture in determining pest control strategies. About 95 percent of growers producing both fruits and vegetables felt that their insect control programs provided satisfactory to excellent results (Table 26), and 100 percent reported disease control as satisfactory to excellent. Growers who specialized in either fruit or vegetable production reported a significant lesser percentage of excellent control with more in the satisfactory to good range and a notable increase in control that was only fair (Table 26).

Use of Personal Protection in Pesticide Operations

Data related to personal protection in pesticide operations is reported in tables 27 to 36. Tables 27 and 28 indicate the percentage of applicators and of mixers/loaders, respectively, who used various protective items during the operation as related to the pesticide applied. It is noted that 24 percent of those who applied fungicides wore goggles or a face shield, 28 percent wore gloves, 23 percent wore boots, 57 percent wore a cotton shirt and trousers, 13 percent wore a spray suit, 19 percent used a respirator, 31 percent wore a head covering, 2 percent had air supply breathing equipment and 5 percent had an enclosed cab on their tractor (Table 27). However, in most cases the percentage of mixer/loaders of fungicides who used thesse protective items was somewhat lower (Table 28).

Personnel involved with herbicides followed a similar trend, although there was less tendency to wear boots, a spray suit, inhalation protection and a head covering. In general, a higher percentage of personnel wore protective clothing and gear when involved with insecticides. About 38 percent of insecticide applicators wore face and eye protection, 44 percent—gloves, 3 percent—protective apron, 26 percent—boots, 61 percent—cotton shirt and trousers, 22 percent—spray suit, 30 percent—respirator, 8 percent—dust mask, 37 percent—head cover, 2 percent—self breathing apparatus and 9 percent—enclosed tractor cab (Table 27).

Comparative percentages for the insecticide mixers/loaders were face and eye protection—35 percent, gloves—45 percent, apron—4 percent, boots—25 percent, cotton shirt and trousers—50 percent, spray suit—10 percent, respirator—21 percent, dust mask—8 percent, head cover—21 percent and self breathing apparatus—3 percent (Table 28). Although not obvious in the reported data, pesticide handlers may have exhibited a little more caution in the use of the more toxic materials.

Tables 29 and 30 show the use of protective clothing and gear used by applicators and mixers/loaders of fungicides, respectively, as related to the crop grouping and the pesticide applied. Tables 31 and 32, 33 and 34, and 35 and 36 provide that same type of data for herbicide use, insecticide use and other pesticide use, respectively.

The use of a protective apron in fungicide applications is associated mostly with operations involving tree fruits. The use of an enclosed cab for fungicide and herbicide application is associated more with tomato and pepper production but was spread among all crops when applying insecticides. The only protective gear worn for herbicide operations in bramble fruit production was the cotton shirt and trousers and a head covering. This may have been the ordinary work clothing of those growers. The use of protective gear in insecticide operations appeared to be equally spread among the growers of all commodity groups (tables 33 and 34) except there was very little use of the protective apron and self breathing units. Gloves and cotton work clothes were the items of protective clothing most often worn by those involved in the use of fumigants, growth regulators, rodenticides and other pesticide chemicals (tables 35 and 36).

TRENDS IN PESTICIDE USE

Fruit Crops

The acreage of fruit crops treated with specific pesticides was relatively equal in the 1978 and 1983 surveys. However, the quantity of pesticide used and the acre treatments indicated a multifold increase in use for 1983. (See publication reference No. 5.) The apple acreage treated with captan differed by only 316 acres, but the acre treatments increased by 72 percent and the quantity used increased 46 percent over the 1978 data. On the other hand, captafol use on apples decreased by about half the quantity reported in 1978, but on only slightly fewer acre treatments and less than half the treated acreage. Copper products were used in significantly greater quantities in 1983 than in 1978. Sulfur use was about equal in acre treatments, but the poundage used declined 37.6 percent. Maneb and mancozeb use in 1983 was 90.9 percent of that in 1978 on slightly more acre treatments but less acreage. Zineb use increased from 2,114 pounds to 5,841 pounds on about twice the acre treatments but on only 150 more acres. Metiram use increased over threefold for 1983 on about twice the acreage and acre treatments. Benomyl use increased more than twofold in quantity and acre treatments, although the treated acreage increased only 20 percent. Dodine was applied to approximately the same number of acres, but the acre treatments increased by 57 percent and the quantity used by 59 percent. Other noticeable differences are the increased use of folpet, glyodin and streptomycin, the decreased use of dichlone and the use of triforine in 1983.

Fungicide use on peaches in 1983 showed a decrease in ferbam but an increase in captan use over 1978. Dichlone use decreased by 87.5 percent in acreage and 71.6 percent in poundage. Benomyl use decreased by over 50 percent in acreage and 41 percent in poundage on 11.8 percent fewer acre treatments. Sulfur use decreased by 75.8 percent in quantity, 80.4 percent in acreage and 98.2 percent in acre treatments.

Cherry growers used more captan and dodine in 1983 but less benomyl and sulfur. The 1978 data for comparison of pesticide use on other fruit crops is not available.

The comparison of data of herbicide use for apple production showed a 61.7 percent decrease in the acreage treated with paraquat in 1983, a 58.9 percent decrease in the acre treatments and a 23.4 percent decrease in poundage. Simazine was used on fewer acres but increased by 31.8 percent in quantity over 1978. Terbacil use in 1983 was insignificant, but oryzalin was used, whereas it was not in 1978.

The quantity of paraquat used for peach production doubled in 1983 over 1978, but the acreage treated increased only by one third on an equivalent number of acre treatments. Simazine use decreased by about 22 percent on fewer acres, and terbacil use became insignificant. Glyphosate, napropamide and oryzalin were used in 1983 but were not in 1978.

Paraquat use on cherries declined somewhat in 1983 and other herbicide use was not reported.

Insecticide use on apples in 1983 increased 2.75 times over that reported in 1978. Comparison of oil use was not made because in 1978 it was reported as pounds and constituted 81.9 percent of the total poundage used for insect control, but in 1983 it was reported as gallons and not added to the total chemical insecticide poundage. Phosmet was used on about the same number of acres, but the acre treatments increased by 73.6 percent above that for 1978 and the poundage increased by 70.3 percent. Similar comparisons for azinphosmethyl on a 20.8 percent increase in acreage were 176 percent increase in acre treatments and 315 percent increase in poundage. Carbaryl use increased by 737 percent for acre treatments and 847 percent in poundage on only a 60 percent increase in acreage. The acreage treated with cyhexatin decreased by 13.7 percent, but increased 210 percent in acre treatments and 76.5 percent in poundage. Application of propargite decreased to limited use in 1983.

Phosalone decreased in acreage treated but increased five to seven times in the acre treatments and quantity used. Ethion use decreased by about half on acreage treated but showed a significant increase in acre treatments and poundage. The quantity of parathion used increased by 164 percent on 383 percent more acre treatments covering essentially the same acreage. Change in methyl parathion use was even more significant from only 64 pounds reported on 64 acres in 1978 to 2,494 pounds on 455 acres reported for 1983. On the other hand, dimethoate use was insignificant in 1983 compared to 1978, phosphamidon use was not reported and demeton use declined. Several other insecticides were reported used in significant quantities in 1983 that were not reported in 1978 or were of very minor use.

The total use of insecticides-miticides for peaches in 1983 declined by 18.3 percent of that used in 1978. Azinphosmethyl use was the only insecticide showing an increase, with 47.8 percent more poundage being used on 29.8 percent more acre treatments but 31.6 percent fewer acres. The use of the miticide cyhexatin increased from 52 pounds in 1978 to 295 pounds in 1983 on 30 fewer acres but 697 more acre treatments. Carbaryl use declined by 59 percent for approximately equal acre treatments on 83.2 percent less acreage. Endosulfan use in 1983 was insignificant compared to 1978. Methyl parathion use in 1983 was about equal to the poundage used in 1978 but on considerably more acreage. Parathion poundage use remained constant but on considerably less acreage. Phosmet use decreased by 29.9 percent in poundage, 60.8 percent in acre treatments and 81.7 percent in acreage.

The cherry acreage treated with phosmet in 1983 was about fivefold greater than that reported for 1978 with a 12-fold increase in acre treatments and a 174-fold increase in quantity. Mercaptodimethur use increased 163 percent in quantity but on 30.4 percent fewer acres. Parathion poundage declined 44 percent, but the treated acreage in 1983 increased 123 percent over that of 1978.

Vegetable Crops

The use of copper fungicide compounds on cabbage in 1983 increased by 352 percent over that reported in 1979 on an 891 percent increase in acreage treated and a 400 percent

increase in acre treatments. In comparison with the 1977 data, the increase in poundage was 151 percent and the acreage 11.8 percent less. Maneb was used on about the same total acreage, but the 209 percent increase in pounds used was applied in 209 percent more acre treatments. Other fungicides reported used in 1979 were not reported for 1983. Mancozeb was reported used in 1977 but not in 1983. Trifluralin was used almost exclusively for weed control in cabbage in 1983 but showed a 70.2 percent decline in acreage treated and a 73.5 decline in poundage used. Nitrofen is no longer registered for vegetable use and pebulate was not reported used in 1983. Insecticide data reported for 1983 showed that azinphosmethyl use decreased by 67.9 percent on 202 fewer acres and 54.4 percent fewer acre treatments compared to 1979. Bacillus thuringiensis treated acreage declined by 64 percent and the acre treatments by 59.2 percent, but the quantity used increased 14.5-fold over 1979. Methamidophos use increased slightly in poundage and doubled in acre treatments, but declined by 43.6 percent in acreage. Parathion use remained almost the same in poundage but experienced some decline in acreage and acre treatments. Methomyl use dropped 10-fold and carbaryl and malathion use was insignificant in 1983. Fenvalerate use was significant in 1983 but was not reported for 1979.

Chlorothalonil remained the major fungicide for use on cucumbers in 1983 and was applied to 75.7 percent more acreage than in 1979, with a corresponding increase of 222 percent in acre treatments and 375 percent in pounds used. Maneb use increased 244 percent, with a 234 percent increase in acre treatments on 79 percent more acres. Mancozeb use decreased 44 percent in acreage and 28.4 percent in poundage on almost equal acre treatments. Copper compounds were not reported in use on cucumbers in 1983. Napropamide was the only herbicide reported used for weed control in cucumbers in 1983, but was not reported used in 1979. Other herbicides used in 1979 were not reported for 1983. Carbaryl, endosulfan and malathion were the major insecticides used on cucumbers in 1979, and the first two maintained that status for 1983. Carbaryl use increased 9.4 percent in poundage on 6.6 percent fewer acre treatments and 0.6 percent fewer acres. Endosulfan use in 1983 increased 64.9 percent in poundage on 87.2 percent more acres and 96.8 percent more acre treatments. Other insecticides listed for 1979 were not reported in 1983.

Parathion was the only insecticide reported used on onions in 1983. It was applied to about the same acreage as in 1979, but to 14.1 percent fewer acre treatments and at a poundage decrease of 51.1 percent. CDAA and chlorpropham remained the most used herbicides in 1983 but were reversed in the order of quantity used from 1979. CDAA use was 36.9 percent greater in 1983 than in 1979, but on 17.6 percent and 25.5 percent less acreage and acre treatments, respectively. Sethoxydim was used in 1983 but not in 1979. The prevalent 1979 use of nitrofen was not experienced in 1983 due to the cancellation of registration. Maneb was the only fungicide reported used on onions in 1983, but it was used in only limited quantities in 1979. Thiram and, to a much lesser degree, mancozeb were the predominant fungicides used in 1979.

Maneb was the only fungicide reported used for sweet corn in 1983. In 1979 the only fungicide use reported was chlorothalonil in very limited quantities. The quantity of herbicide used in sweet corn production decreased dramatically from that reported in 1979. The use of alachlor, which was the primary herbicide of choice in 1979, decreased 88.7 percent in poundage, 77 percent in acre treatments and 90 percent in acreage. Atrazine usage decreased by 61.2 percent in poundage, 64.2 percent in acre treatments and 61.5 percent in acreage. Cyanazine use decreased 59.7 percent in poundage, 53.4 percent in acre treatments and 43.4 percent in acreage. However, butylate use increased by 36.1 percent but on 13.4 percent less acreage and acre treatments. Metolachlor was not reported used in 1979, but ranked equally with alachlor and butylate in the acres treated in 1983.

Comparison of insecticide use for sweet corn in 1983 showed that carbaryl decreased by 36.6 percent of that used in 1979 with a corresponding decrease of 48.9 percent in acre treatments and 35.9 percent in acreage. Methomyl use decreased by 18.3 percent in poundage, but increased 50.9 percent in acre treatments and 72.5 percent in acreage. Parathion use increased 52.4 percent in poundage, but declined 25.2 percent in acre treatments and 46.7 percent in acreage. Methyl parathion use increased 503 percent in poundage with an increase of 411 percent in acre treatments and 51.8 percent in acreage. Oxydemeton-methyl use increased approximately fourfold over 1979 usage. Malathion use decreased about fivefold except for acres treated, which decreased about threefold. Diazinon and fonofos use increased some in 1983.

In 1983 metribuzin, trifluralin, chloramben and pebulate were the herbicides of choice in tomato production. In 1979 the major uses were attributed to trifluralin, metribuzin, diphenamid, pebulate and chloramben. Metribuzin was used on 63.8 percent less acreage in 1983 compared to 1979, 56.5 percent fewer acre treatments and 60.2 percent less poundage. The reduction in trifluralin use was even more pronounced, i.e., 81.7 percent in acreage, 82.1 percent in acre treatments and 76.8 percent in poundage. Chloramben usage increased in 1983 by 34.7 percent in acreage and 66.1 percent in poundage, but decreased slightly in acre treatments. Pebulate use decreased 65.2 percent in poundage in 1983 and 89 percent in acre treatments and acreage.

In 1979, 72,697 pounds of chlorothalonil was applied to tomatoes. In 1983 that quantity was 17,950 pounds or a reduction of 75.3 percent with a corresponding reduction of 70 percent in acre treatments and 83.2 percent in acreage treated. Similar reductions were noted also for copper compounds (68.3, 70.3 and 81.5 percent, respectively), mancozeb (58.6, 58.5 and 72.9 percent, respectively), maneb (91.0, 91.6 and 97.1 percent, respectively) and captafol (87.3, 87.2 and 86.9 percent, respectively). Total fungicide use on tomatoes in 1983 was only 24.6 percent of the quantity applied in 1979.

Insecticide use on tomatoes, however, increased 120 percent with the bulk of that attributed to carbaryl. From 1979 to 1983 carbaryl use increased 165 percent, with an increase of 29.8 percent in acre treatments but a decrease of 16.3 percent in the acreage treated. Endosulfan use, however, decreased by 75.5 percent in poundage, 77.3 percent in acre treatments and 90.9 percent in treated acreage. Bacillus thuringiensis use increased many fold (from 17 pounds in 1979 to 4,809 pounds in 1983) but only on 75.8 percent more acres. Methomyl use increased by 36.7 percent in poundage, 253 percent in acre treatments and 159 percent in acreage treated. Methamidophos was used in 1983 but not in 1979. The use of azinphosmethyl and diazinon was important in 1979, but these were used in insignificant quantities in 1983.

Comparative pesticide use data for other crops such as carrots, eggplant, green beans, peppers, potatoes, pumpkins and squash require reference to the pesticide use survey for fresh market vegetables of 1977. However, detailed

comparative relationships are inconclusive because of differences in that survey program vs. the one of 1983.

The major fungicide used on potatoes in 1977 was mancozeb. Other important fungicides were metiram, copper and captafol. In 1983 maneb and mancozeb accounted for almost all of the fungicide use on potatoes, but the combined quantities were only 54.2 percent of the mancozeb applied in 1977, and the treated acreage for both products was only 80.6 percent of the former acreage for mancozeb alone. EPTC, alachlor and linuron remained the major herbicides used in 1983, but the quantities used and acres treated were significantly less than in 1977. Carbaryl use increased by 62.1 percent over that of 1977 but on 43.2 percent fewer acres. Aldicarb use increased 37.7 percent on 41.9 percent more acreage, and methamidophos use increased 99.5 percent and 23 percent, respectively. Other notable changes were the uses of carbofuran, diazinon, oxamyl, permethrin and phorate in 1983, an 83.3 percent reduction in the use of parathion and the discontinuation in use of chlordane, disulfoton and methomyl.

In 1983 carbaryl replaced diazinon and malathion as the insect control agent for carrots on an approximately equal acreage as in 1977. It was also the choice for treating eggplant and green beans, whereas it had been of only minor significance previously. In pumpkin production, carbaryl use increased 300 percent from 1977 to 1983 on an 89.3 percent increase in acreage. The insecticides and fungicides used on peppers and squash changed during the period, whereas the major herbicides used on those crops remained trifluralin and chloramben, respectively, but at significantly different acreages and amounts. Chloramben was the only herbicide reported used on pumpkins in both surveys, but the acreage treated and quantity used was greatly reduced in 1983. Chloramben use on squash, however, increased 296 percent in amount and 108 percent in acreage as reported in 1983.

Several conclusions can be drawn from the previous discussion on pesticide use trends in Ohio fruit and vegetable production. Several pesticides were phased out between 1977 and 1983 and newer pesticides became of common use. Growers appeared, however, to prefer the use of those pesticides that had proved in the past to be effective rather than rely on those with less use evaluation. However, the advent of some biological control agents and the development of newer types of chemical pesticides have given the grower more options in pest control. Thus, perhaps the most significant observation is the increased intensity of crop pest control programs using a more diverse selection of pesticides generally in larger quantities of pesticides per treatment and more applications during the season.

Table 1. Response of Commodity Growers to the Pesticide Use Survey Questionaire

	Crop		Survey Data	
Commodity	Estimated Acreage 1983[a]	Acres Reported	% State Total Acreage	No. of Respondents
Fruit				
Apples	9713	1070.0	11.0	56
Blueberries	147	12.0	8.2	2
Cherries	b	20.5	5.1[b]	8
Grapes	3067	179.9	5.9	20
Melons[c]	300	132.5	44.2	13
Peaches	1358	149.5	11.0	20
Pears	b	40.0	7.0[b]	10
Plums	b	13.8	5.5[b]	8
Raspberries[d]	394	23.5	6.0	4
Strawberries	1900	146.5	7.7	17
Others[e]	—	34.0	—	3
Vegetables				
Broccoli	50	7 5	15.0	3
Cabbage	2800	762 5	27.2	11
Carrots	1000	1000 0	100.0	1
Cauliflower	300	24 5	8.1	4
Celery	450	20.0	4.4	1
Cucumbers[f]	6000	65.0	1.2	5
Eggplant	200	27 0	13.5	1
Green Beans	725	463.5	64.0	4
Greens	b	124.0	62.0[b]	2
Lettuce	650	10.0	1.5	1
Onions	550	37.0	6.7	1
Peas[g]	250	2.0	0.8	1
Peppers	650	101.5	15.6	5
Potatoes	10,400	1936.5	18.6	18
Pumpkins	b	64.0	5.1[b]	5
Squash	700	111.0	15.9	2
Sweet Corn	15,700	2462.0	15.9	37
Tomatoes[h]	20,500	6506.0	31.9	23
Others[i]	—	133.0	—	11

[a] Estimated by crop specialists of the Ohio Cooperative Extension Service and the Ohio Crop Reporting Service

[b] No estimate for 1983 Estimate from 1977-79 surveys indicate cherries 400A, pears 572A, plums 245A, greens (chard, spinach) 200A and pumpkins 1250A

[c] Includes cantaloupes, melons and watermelons.

[d] Includes raspberries and blackberries.

[e] Reported as orchards and non-bearing apples.

[f] Includes cucumbers and pickles

[g] Pick your own only.

[h] Includes fresh market and processing (1,300A + 19,200A).

[i] Reported as vegetables only

Table 2. Acreage of Fruit Crops in Ohio Treated with Specific Pesticides in 1983

Pesticide	Crop and Acres Treated										
	Apple	Blueberry	Cherry	Grape	Melon	Peach	Pear	Plum	Raspberry	Strawberry	Total
Fungicides											
Benomyl	3914	—	78	93	181	314	71	45	275	1292	6263
Bordeaux	—	—	—	136	—	—	—	—	—	—	136
Captafol	700	—	—	—	—	—	—	—	—	—	700
Captan	4573	—	78	1830	—	714	—	136	342	1188	8861
Chlorothalonil	—	—	—	—	290	—	—	—	—	—	290
Copper	727	—	—	780	—	73	—	—	—	—	1580
Dichlone	—	—	—	—	—	150	—	—	—	—	150
Dodine	4332	—	98	—	—	—	—	—	—	—	4430
Ferbam	14	—	—	1008	—	164	—	36	—	—	1222
Folpet	245	—	—	678	—	—	—	—	—	—	923
Glyodin	500	—	—	—	—	91	—	—	—	—	591
Lime sulfur	—	—	—	542	—	—	—	—	275	—	817
Mancozeb	2493	—	—	110	11	25	—	—	—	—	2639
Maneb	—	—	—	424	23	9	—	—	—	—	456
Metiram	4800	—	—	—	—	—	—	—	—	—	4800
Streptomycin	2032	—	—	—	—	—	21	—	—	—	2053
Sulfur	1155	—	—	50	—	309	21	—	—	—	1535
Thiophanate-methyl	273	—	—	—	—	—	—	—	—	—	273
Thiram	—	—	—	—	—	14	—	—	—	—	14
Triadimefon	—	—	—	51	—	—	—	—	—	—	51
Triforine	382	122	—	—	—	—	—	—	—	—	504
Zineb	732	—	—	—	—	—	—	36	—	—	768
Herbicides											
2,4-D	—	—	—	—	—	—	—	—	50	195	245
Bensulide	—	—	—	—	9	—	—	—	—	—	9
Chloroxuron	—	—	—	—	—	—	—	—	—	214	214
DCPA	—	—	—	—	—	—	—	—	50	19	69
Dinoseb	—	—	—	51	—	—	—	—	—	—	51
Diphenamid	—	—	—	—	—	—	—	—	50	149	199
Diuron	100	146	—	1119	—	—	—	—	—	—	1365
Glyphosate	9	—	—	593	—	9	—	—	13	—	624
Napropamide	—	—	—	—	—	136	—	36	50	675	897
Naptalam	—	—	—	—	9	—	—	—	—	—	9
Oryzalin	455	—	—	—	—	91	—	—	267	—	813
Paraquat	818	—	59	180	—	477	14	82	—	—	1630
Simazine	1300	122	—	51	—	91	14	—	50	—	1628
Terbacil	—	24	—	—	—	—	—	—	50	435	509
Insecticides											
Amitraz	—	—	—	—	—	—	71	—	—	—	71
Azinphosmethyl	4891	—	—	837	43	764	143	109	—	448	7235
Carbaryl	1714	122	—	2388	88	127	—	—	17	364	4820
Carbofuran	—	—	—	—	90	—	—	—	—	—	90
Chlorpyrifos	36	—	—	—	—	—	—	—	—	—	36
Cyhexatin	2745	—	—	—	—	91	—	—	—	—	2836
Demeton	91	—	—	—	—	—	—	—	—	—	91
Diazinon	177	—	—	—	—	—	—	—	—	—	177
Dicofol	286	—	—	424	—	73	286	—	—	52	1121
Dimethoate	32	—	—	—	—	—	—	—	—	—	32
Dinocap	180	—	—	424	—	27	—	—	—	—	631
Endosulfan	2064	—	—	—	25	23	—	45	—	506	2663
Ethion	1073	—	—	—	—	—	—	—	—	—	1073
Fenbutatin-oxide	109	—	—	—	—	—	—	—	—	—	109
Fenvalerate	491	—	—	—	23	91	—	—	—	—	605
Malathion	100	—	—	—	32	—	—	—	—	143	275
Methomyl	709	—	—	—	—	91	—	—	—	—	800
Methoxychlor	—	—	—	644	—	—	—	—	—	—	644
Methyl parathion	455	—	—	357	—	91	—	—	—	—	903
Oil	3859	—	—	68	—	—	21	—	—	—	3948
Oxamyl	1064	—	—	—	—	—	—	—	—	—	1064
Parathion	347	—	20	1625	—	136	—	—	—	—	2128
Permethrin	—	—	—	—	—	—	286	—	—	—	286
Phosalone	591	—	—	424	—	—	—	—	—	—	1016
Phosmet	7936	—	157	110	—	209	379	45	—	—	8836
Propargite	155	—	—	—	—	9	—	—	—	—	164
Tetradifon	136	—	—	—	—	—	—	—	—	—	136

Table 2. Acreage of Fruit Crops in Ohio Treated with Specific Pesticides in 1983 — Continued

Pesticide	Crop and Acres Treated										
	Apple	Blueberry	Cherry	Grape	Melon	Peach	Pear	Plum	Raspberry	Strawberry	Total
Growth Regulators											
Daminozide	873	—	—	288	—	—	—	—	—	—	1161
Ethephon	455	—	—	—	—	—	—	—	—	—	455
NAA	468	—	—	—	—	—	—	—	—	—	468
Silvex	364	—	—	—	—	—	—	—	—	—	364
Other											
Chloropicrin	—	—	—	—	—	—	—	—	—	13	13
Mercaptodimethur	—	—	78	—	—	—	—	—	—	—	78
Methyl bromide	—	—	—	—	—	—	—	—	50	82	132
Zinc phosphate	182	—	—	—	—	—	—	—	—	—	182

Table 3. Acre Treatments[1] of Fruit Crops in Ohio Treated with Specific Pesticides – 1983

Pesticide	Apple	Blueberry	Cherry	Grape	Melon	Peach	Pear	Plum	Raspberry	Strawberry	Total
	Acre Treatments										
Fungicides											
Benomyl	27614	—	294	873	543	1977	429	409	1096	5636	38871
Bordeaux	—	—	—	271	—	—	—	—	—	—	271
Captafol	1727	—	—	—	—	—	—	—	—	—	1727
Captan	36191	—	235	4493	—	4532	—	1045	1048	5273	53177
Chlorothalonil	—	—	—	—	1267	—	—	—	—	—	1267
Copper	1409	—	—	847	—	145	—	—	—	—	2401
Dichlone	—	—	—	—	—	695	—	—	—	—	695
Dodine	23345	—	529	—	—	—	—	—	—	—	23874
Ferbam	14	—	—	4568	—	300	—	36	—	—	4918
Folpet	564	—	—	2025	—	—	—	—	—	—	2589
Glyodin	6500	—	—	—	—	818	—	—	—	—	7318
Lime sulfur	—	—	—	542	—	—	—	—	—	—	542
Mancozeb	16412	—	—	788	105	—	—	—	—	—	17305
Maneb	—	—	—	424	113	73	—	—	—	—	610
Metiram	31509	—	—	—	—	—	—	—	—	—	31509
Streptomycin	10409	—	—	—	—	—	107	—	—	—	10516
Sulfur	8809	—	—	610	—	872	107	—	275	—	10673
Thiophanate-methyl	2182	—	—	—	—	—	—	—	—	—	218
Thiram	—	—	—	—	—	27	—	—	—	—	27
Triadimefon	327	—	—	51	—	—	—	—	—	—	378
Triforine	3055	122	—	—	—	—	—	—	—	—	3177
Zineb	2677	—	—	—	—	—	—	182	—	—	2859
Totals	172744	122	1058	15492	2028	9439	643	1672	2779	10909	216986
Herbicides											
2,4-D	—	—	—	—	—	—	—	—	50	195	245
Bensulide	—	—	—	—	9	—	—	—	—	—	9
Chloroxuron	—	—	—	—	—	—	—	—	—	214	214
DCPA	—	—	—	—	—	—	—	—	50	19	69
Dinoseb	—	—	—	51	—	—	—	—	—	—	51
Diphenamid	—	—	—	—	—	—	—	—	50	149	199
Diuron	100	268	—	1119	—	—	—	—	—	—	1487
Glyphosate	9	—	—	593	—	73	—	—	13	—	688
Napropamide	—	—	—	—	—	136	—	36	50	675	897
Naptalam	—	—	—	—	9	—	—	—	—	—	9
Oryzalin	455	—	—	—	—	91	—	—	267	—	813
Paraquat	1082	—	176	178	—	523	14	173	—	—	2146
Simazine	1300	244	—	51	—	91	14	—	50	—	1750
Terbacil	—	24	—	—	—	—	—	—	50	565	639
Totals	2946	536	176	19927	18	914	28	209	580	1817	9217
Insecticides											
Amitraz	—	—	—	—	—	—	429	—	—	—	429
Azinphosmethyl	34245	—	—	2836	106	4282	929	618	—	1065	44081
Carbaryl	12827	122	—	7295	699	1055	—	—	117	1688	23803
Carbofuran	—	—	—	—	90	—	—	—	—	—	90
Chlorpyrifos	36	—	—	—	—	—	—	—	—	—	36
Cyhexatin	15300	—	—	—	—	818	—	—	—	—	16118
Demeton	182	—	—	—	—	—	—	—	—	—	182
Diazinon	1032	—	—	—	—	—	—	—	—	—	1032
Dicofol	755	—	—	2119	—	145	1429	—	—	208	4656

Table 3. Acre Treatments[1] of Fruit Crops in Ohio Treated with Specific Pesticides - 1983—Continued

Pesticide	Apple	Blueberry	Cherry	Grape	Melon	Peach	Pear	Plum	Raspberry	Strawberry	Total
Dimethoate	32	—	—	—	—	—	—	—	—	—	32
Dinocap	1052	—	—	847	—	218	—	—	—	—	2117
Endosulfan	5491	—	—	—	747	45	—	91	—	662	7036
Ethion	3282	—	—	—	—	—	—	—	—	—	3282
Fenbutatin-oxide	1390	—	—	—	—	—	—	—	—	—	1390
Fenvalerate	6400	—	—	—	226	818	—	—	—	—	7444
Malathion	1000	—	—	—	122	—	—	—	—	299	1421
Methomyl	6873	—	—	—	—	818	—	—	—	—	7691
Methoxychlor	—	—	—	1322	—	—	—	—	—	—	1322
Methyl parathion	4752	—	—	994	—	505	—	—	—	—	6251
Oil	5005	—	—	68	—	—	21	—	—	—	5094
Oxamyl	2973	—	—	—	—	—	—	—	—	—	2973
Parathion	3585	—	59	4527	—	758	—	—	—	—	8929
Permethrin	—	—	—	—	—	—	1429	—	—	—	1429
Phosalone	6500	—	—	847	—	—	—	—	—	—	7347
Phosmet	62082	—	588	593	—	1359	1986	409	—	—	67017
Propargite	191	—	—	—	—	9	—	—	—	—	200
Tetradifon	1073	—	—	—	—	—	—	—	—	—	1073
Totals	176058	122	647	21448	1990	10830	6223	1118	117	3922	222475
Growth Regulators											
Daminozide	873	—	—	288	—	—	—	—	—	—	1161
Ethephon	455	—	—	—	—	—	—	—	—	—	455
NAA	977	—	—	—	—	—	—	—	—	—	977
Silvex	364	—	—	—	—	—	—	—	—	—	364
Totals	2669	—	—	288	—	—	—	—	—	—	2957
Other											
Chloropicrin	—	—	—	—	—	—	—	—	—	13	13
Mercaptodimethur	—	—	314	—	—	—	—	—	—	—	314
Methyl bromide	—	—	—	—	—	—	—	—	100	159	259
Zinc phosphate	364	—	—	—	—	—	—	—	—	—	364
Totals	364	—	314	—	—	—	—	—	100	172	950

[1] Acre treatment is equal to the acres reported treated multiplied by the number of times that acreage was treated with the same pesticide.

Table 4. Quantity of Specific Pesticides Used on Fruit Crops in Ohio - 1983

	Crop and Pounds of Pesticide Active Ingredient Applied										
Pesticide	**Apple**	**Blueberry**	**Cherry**	**Grape**	**Melon**	**Peach**	**Pear**	**Plum**	**Raspberry**	**Strawberry**	**Total**
Fungicides											
Benomyl	8252	—	85	238	136	568	86	155	543	4008	14071
Bordeaux	—	—	—	542	—	—	—	—	—	—	542
Captafol	8269	—	—	—	—	—	—	—	—	—	8269
Captan	57239	—	435	6853	—	8275	—	780	2434	12725	88741
Chlorothalonil	—	—	—	—	1741	—	—	—	—	—	1741
Copper	2682	—	—	1624	—	1309	—	—	—	—	5615
Dichlone	—	—	—	—	—	218	—	—	—	—	218
Dodine	18678	—	386	—	—	—	—	—	—	—	19064
Ferbam	5	—	—	9146	—	1033	—	83	—	—	10267
Folpet	1418	—	—	2678	—	—	—	—	—	—	4096
Glyodin	1659	—	—	—	—	205	—	—	—	—	1864
Lime sulfur	—	—	—	4339	—	—	—	—	9033	—	13372
Mancozeb	56221	—	—	976	54	946	—	—	—	—	58197
Maneb	—	—	—	678	135	73	—	—	—	—	886
Metiram	95084	—	—	—	—	—	—	—	—	—	95084
Streptomycin	1654	—	—	—	—	—	6	—	—	—	1660
Sulfur	23623	—	—	1403	—	12113	610	—	—	—	37749
Thiophanate-methyl	284	—	—	—	—	—	—	—	—	—	284
Thiram	—	—	—	—	—	177	—	—	—	—	177
Triadimefon	—	—	—	76	—	—	—	—	—	—	76
Triforine	932	37	—	—	—	—	—	—	—	—	969
Zineb	5841	—	—	—	—	—	—	454	—	—	6295
Totals	281841	37	906	28553	2066	24917	702	1472	12010	16733	369237
Herbicides											
2,4-D	—	—	—	—	—	—	—	—	100	195	295
Bensulide	—	—	—	—	45	—	—	—	—	—	45
Chloroxuron	—	—	—	—	—	—	—	—	—	838	838

Table 4. Quantity of Specific Pesticides Used on Fruit Crops in Ohio - 1983—Continued

Pesticide	Crop and Pounds of Pesticide Active Ingredient Applied										
	Apple	Blueberry	Cherry	Grape	Melon	Peach	Pear	Plum	Raspberry	Strawberry	Total
DCPA	—	—	—	—	—	—	—	—	300	1474	1774
Dinoseb	—	—	—	51	—	—	—	—	—	—	51
Diphenamid	—	—	—	—	—	—	—	—	200	726	926
Diuron	192	410	—	1529	—	—	—	—	—	—	2131
Glyphosate	—	—	—	658	—	109	—	—	9	—	776
Napropamide	—	—	—	—	—	409	—	109	100	2006	2624
Naptalam	—	—	—	—	27	—	—	—	—	—	27
Oryzalin	1195	—	—	—	—	239	—	—	800	—	2234
Paraquat	1116	—	44	95	—	673	7	45	—	—	1980
Simazine	4160	390	—	143	—	291	46	—	120	—	5150
Terbacil	—	20	—	—	—	—	—	—	60	352	432
Totals	6663	820	44	2476	72	1721	53	154	1689	5591	19283
Insecticides											
Amitraz	—	—	—	—	—	—	321	—	—	—	321
Azinphosmethyl	28644	—	—	3377	161	2226	571	224	—	455	35658
Carbaryl	21120	122	—	13629	754	645	—	—	117	3260	39647
Carbofuran	—	—	—	—	108	—	—	—	—	—	108
Chlorpyrifos	5	—	—	—	—	—	—	—	—	—	5
Cyhexatin	5269	—	—	—	—	295	—	—	—	—	5564
Demeton	273	—	—	—	—	—	—	—	—	—	273
Diazinon	3037	—	—	—	—	—	—	—	—	—	3037
Dicofol	1220	—	—	742	—	191	2000	—	—	436	4589
Dimethoate	16	—	—	—	—	—	—	—	—	—	16
Dinocap	3450	—	—	390	—	60	—	—	—	—	3900
Endosulfan	7982	—	—	—	361	23	—	45	—	769	9180
Ethion	2289	—	—	—	—	—	—	—	—	—	2289
Fenbutatin-oxide	982	—	—	—	—	—	—	—	—	—	982
Fenvalerate	1915	—	—	—	54	245	—	—	—	—	2214
Malathion	1000	—	—	—	136	—	—	—	—	448	1584
Methomyl	4709	—	—	—	—	556	—	—	—	—	5265
Methoxychlor	—	—	—	2559	—	—	—	—	—	—	2559
Methyl parathion	2494	—	—	544	—	214	—	—	—	—	3252
Oil	(25608 gal)	—	—	(136 gal)	—	—	(64 gal)	—	—	—	(25808 gal)
Oxamyl	1715	—	—	—	—	—	—	—	—	—	1715
Parathion	1881	—	53	2476	—	321	—	—	—	—	4731
Permethrin	—	—	—	—	—	—	1371	—	—	—	1371
Phosalone	9750	—	—	1593	—	—	—	—	—	—	11343
Phosmet	94472	—	1029	441	—	2323	3479	736	—	—	102480
Propargite	77	—	—	—	—	5	—	—	—	—	82
Tetradifon	1338	—	—	—	—	—	—	—	—	—	1338
Totals	193638	122	1082	25751	1574	7104	7742	1005	117	5368	243503
Growth Regulators											
Daminozide	1918	—	—	230	—	—	—	—	—	—	2148
Ethephon	59	—	—	—	—	—	—	—	—	—	59
NAA	40	—	—	—	—	—	—	—	—	—	40
Silvex	6	—	—	—	—	—	—	—	—	—	6
Totals	2023	—	—	230	—	—	—	—	—	—	2253
Other											
Chloropicrin	—	—	—	—	—	—	—	—	—	52	52
Mercaptodimethur	—	—	376	—	—	—	—	—	—	—	376
Methyl bromide	—	—	—	—	—	—	—	—	9800	15273	25073
Zinc phosphate	36	—	—	—	—	—	—	—	—	—	36
Totals	36	—	376	—	—	—	—	—	9800	15325	25537

Table 5. Acreage of Vegetable Crops in Ohio Treated with Specific Pesticides —1983

Pesticide	Crop and Acres Treated																
	Broc-coli	Cab-bage	Car-rot	Cauli-flower	Celery	Cu-cum-ber	Egg-plant	Green Beans	Greens	Onion	Pep-per	Potato	Pump-kin	Squash	Sweet Corn	Tomato	Total
Fungicides																	
Benomyl	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	934	934
Captafol	—	—	—	—	—	—	—	—	—	—	641	—	—	691	—	1878	3210
Captan	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
Chlorothalonil	—	—	—	—	—	2917	—	—	—	—	—	—	294	—	—	2752	5963
Copper	33	1140	—	62	—	1667	—	—	—	—	673	226	—	—	—	4746	8547
Mancozeb	—	—	—	—	—	417	—	—	—	—	—	2430	—	—	—	3022	5869
Maneb	—	221	—	—	—	1250	—	—	—	552	—	3027	—	—	629	313	5992
Metiram	—	—	—	—		—	—	—	—	—	641	—	—	691	—	—	1332
Herbicides																	
Alachlor	—	6	—	—	—	—	—	—	—	—	—	581	—	—	610	—	1197
Atrazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1497	—	1497
Bentazon	—	—	—	—	—	—	—	125	—	—	—	—	—	—	—	—	125
Butylate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	660	—	660
CDAA	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Chloramben	—	—	—	—	—	—	—	722	—	—	—	—	98	767	—	799	2386
Chlorpropham	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Cyanazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2535	—	2535
DCPA	—	—	—	—	—	—	52	—	—	—	—	—	—	—	—	—	52
Dinoseb	—	—	—	—	—	—	—	—	—	—	—	54	—	—	—	—	54
Diquat	—	—	—	—	—	—	—	—	—	—	—	1075	—	—	—	—	1075
EPTC	—	—	—	—	—	—	—	—	—	—	—	1731	—	—	—	—	1731
Glyphosate	—	—	—	—	—	—	—	—	—	—	—	645	—	—	—	—	645
Linuron	—	—	—	—	—	—	—	—	—	—	—	1269	—	—	—	—	1269
Metolachlor	—	—	—	—	—	—	—	—	—	—	—	269	—	—	629	—	898
Metribuzin	—	—	—	—	—	—	—	—	—	—	—	1247	—	—	—	4091	5338
Napropamide	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	78	78
Naptalam	—	—	—	—	—	1667	—	—	—	—	—	—	—	—	—	—	1667
Paraquat	—	—	—	—	—	—	—	—	—	—	—	22	—	—	—	—	22
Pebulate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	345	345
Sethoxydim	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Trifluralin	13	699	—	49	—	—	—	—	—	—	654	—	—	—	—	2138	3553
Insecticides																	
Acephate	—	—	—	—	—	—	—	—	—	—	679	—	—	—	—	—	679
Aldicarb	—	—	—	—	—	—	—	—	—	—	—	6704	—	—	—	—	6704
Azinphosmethyl	33	1011	—	62	—	—	—	—	—	—	—	301	—	—	—	9	1416
B.T.	47	1154	—	296	454	—	—	—	161	—	—	—	—	—	—	1674	3786
Carbaryl	—	6	1000	—	—	6667	52	175	—	—	96	5968	882	—	5544	19461	39851
Carbofuran	—	—	—	—	—	—	—	—	—	—	—	2457	—	—	138	—	2595
Diazinon	—	—	—	—	454	—	—	—	161	—	—	2151	—	—	164	—	2930
Dicofol	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94	94
Dimethoate	—	—	—	—	—	—	—	—	—	—	—	763	—	—	—	—	763
Endosulfan	—	—	—	—	—	2917	—	—	—	—	641	—	980	691	—	1085	6314
Fenvalerate	33	1912	—	62	—	—	—	—	—	—	—	2500	—	—	1126	925	6558
Fonofos	—	—	—	—	—	—	—	—	—	—	—	575	—	—	629	—	1204
Malathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	157	—	157
Methamidophos	—	294	—	—	—	—	—	—	—	—	—	5602	—	—	—	5110	11006
Methomyl	—	88	—	49	—	—	—	—	—	—	13	—	—	—	5377	6379	11906
Methyl parathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2037	—	2037
Mevinphos	—	—	—	—	454	—	—	—	—	—	—	—	—	—	—	—	454
Oxamyl	—	—	—	—	—	—	—	—	—	—	—	1113	—	—	—	—	1113
Oxydemeton-methyl	—	18	—	—	—	—	—	—	—	—	32	—	98	—	4119	—	4267
Parathion	33	919	50	62	454	—	—	—	—	552	641	683	—	691	1667	—	5752
Permethrin	—	37	—	—	—	—	—	—	—	—	—	597	—	—	220	—	854
Phorate	—	—	—	—	—	—	—	—	—	—	—	1075	—	—	—	—	1075
Phosmet	—	—	—	—	—	—	—	—	—	—	—	210	—	—	—	—	210

Table 6. Acre Treatments[1] of Vegetable Crops in Ohio Treated with Specific Pesticides - 1983

Pesticide	Crop and Acres Treated																
	Broccoli	Cabbage	Carrot	Cauliflower	Celery	Cucumber	Eggplant	Green Beans	Greens	Onion	Pepper	Potato	Pumpkin	Sweet Squash	Corn	Tomato	Total
Fungicides																	
Benomyl	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1069	1069
Captafol	—	—	—	—	—	—	—	—	—	—	3205	—	—	3459	—	4784	11448
Captan	—	22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22
Chlorothalonil	—	—	—	—	—	8750	—	—	—	—	—	—	1373	—	—	15489	25612
Copper	133	7206	—	247	—	1667	—	—	—	—	2083	226	—	—	—	16605	28167
Mancozeb	—	—	—	—	—	2038	—	—	—	—	—	20640	—	—	—	14429	37152
Maneb	—	2647	—	—	—	3750	—	—	—	2761	—	24140	—	—	3145	2508	38951
Metiram	—	—	—	—	—	—	—	—	—	—	3205	—	—	3459	—	—	6664
Totals	133	9875	—	247	—	16250	—	—	—	2761	8493	45006	1373	6918	3145	54884	149085
Herbicides																	
Alachlor	—	6	—	—	—	—	—	—	—	—	—	581	—	—	1393	—	1980
Atrazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1497	—	1497
Bentazon	—	—	—	—	—	—	—	125	—	—	—	—	—	—	—	—	125
Butylate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	660	—	660
CDAA	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Chloramben	—	—	—	—	—	—	—	722	—	—	—	—	980	3535	—	799	6036
Chlorpropham	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Cyanazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2535	—	2535
DCPA	—	—	—	—	—	—	52	—	—	—	—	—	—	—	—	—	52
Dinoseb	—	—	—	—	—	—	—	—	—	—	—	54	—	—	—	—	54
Diquat	—	—	—	—	—	—	—	—	—	—	—	1075	—	—	—	—	1075
EPTC	—	—	—	—	—	—	—	—	—	—	—	1731	—	—	—	—	1731
Glyphosate	—	—	—	—	—	—	—	—	—	—	—	645	—	—	—	—	645
Linuron	—	—	—	—	—	—	—	—	—	—	—	1269	—	—	—	—	1269
Metolachlor	—	—	—	—	—	—	—	—	—	—	—	269	—	—	629	—	898
Metribuzin	—	—	—	—	—	—	—	—	—	—	—	1586	—	—	—	6113	7699
Napropamide	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	304	304
Naptalam	—	—	—	—	—	1667	—	—	—	—	—	—	—	—	—	—	1667
Paraquat	—	—	—	—	—	—	—	—	—	—	—	22	—	—	—	—	22
Pebulate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	345	345
Sethoxydim	—	—	—	—	—	—	—	—	—	1104	—	—	—	—	—	—	1104
Trifluralin	13	699	—	49	—	—	—	—	—	—	654	—	—	—	—	2138	3553
Totals	13	705	—	49	—	1667	52	847	—	2208	654	7232	980	3535	6714	9699	34355
Insecticides																	
Acephate	—	—	—	—	—	—	—	—	—	—	3288	—	—	—	—	—	3288
Aldicarb	—	—	—	—	—	—	—	—	—	—	—	7280	—	—	—	—	7280
Azinphosmethyl	67	2371	—	123	—	—	—	—	—	—	—	1522	—	—	—	69	4152
B.T.	273	5787	—	2185	909	—	—	—	645	—	—	—	—	—	—	1674	11473
Carbaryl	—	22	6000	—	—	11250	415	619	—	—	577	19946	2549	—	12846	95740	149964
Carbofuran	—	—	—	—	—	—	—	—	—	—	—	2919	—	—	138	—	3057
Diazinon	—	—	—	—	455	—	—	—	645	—	—	2151	—	—	478	—	3729
Dicofol	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94	94
Dimethoate	—	—	—	—	—	—	—	—	—	—	—	763	—	—	—	—	763
Endosulfan	—	—	—	—	—	5417	—	—	—	—	3205	—	2549	3459	—	5677	20307
Fenvalerate	133	9154	—	247	—	—	—	—	—	—	—	3118	—	—	11000	925	24577
Fonofos	—	—	—	—	—	—	—	—	—	—	—	2301	—	—	629	—	2930
Malathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	472	—	472
Methamidophos	—	3088	—	—	—	—	—	—	—	—	—	13753	—	—	—	9812	26653
Methomyl	—	456	—	296	—	—	—	—	—	—	77	—	—	—	21607	12915	35351
Methyl parathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9270	—	9270
Mevinphos	—	—	—	—	909	—	—	—	—	—	—	—	—	—	—	—	909
Oxamyl	—	—	—	—	—	—	—	—	—	—	—	3989	—	—	—	—	3989
Oxydemeton-methyl	—	92	—	—	—	—	—	—	—	—	32	—	98	—	4119	—	4341
Parathion	133	3676	50	247	909	—	—	—	—	2761	1923	1883	—	3459	7585	—	22626
Permethrin	—	294	—	—	—	—	—	—	—	—	—	1898	—	—	881	—	3073
Phorate	—	—	—	—	—	—	—	—	—	—	—	1075	—	—	—	—	1075
Phosmet	—	—	—	—	—	—	—	—	—	—	—	1258	—	—	—	—	1258
Totals	606	24940	6050	3098	3182	16667	415	619	1290	2761	9102	63856	5196	6918	69025	126906	340631
Other																	
Ethephon	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1661	1661
MH-30	—	—	—	—	—	—	—	—	—	—	—	763	—	—	—	—	763
Totals	—	—	—	—	—	—	—	—	—	—	—	763	—	—	—	1661	2424

[1] Acre treatment is equal to the acres reported treated multiplied by the number of times that acreage was treated with the same pesticide.

Table 7. Quantity of Pesticides Used on Vegetable Crops in Ohio - 1983

Pesticide	Crop and Pounds of Pesticide Active Ingredient Applied																
	Broc-coli	Cab-bage	Car-rot	Cauli-flower	Celery	Cu-cum-ber	Egg-plant	Green Beans	Greens	Onion	Pep-per	Potato	Pump-kin	Squash	Sweet Corn	Tomato	Total
Fungicides																	
Benomyl	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	377	377
Captafol	—	—	—	—	—	—	—	—	—	—	3205	—	—	3459	—	7428	14092
Captan	—	44	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44
Chlorothalonil	—	—	—	—	—	16833	—	—	—	—	—	—	2014	—	—	17950	36797
Copper	200	7279	—	370	—	—	—	—	—	—	2083	452	—	—	—	22658	33042
Mancozeb	—	—	—	—	—	3333	—	—	—	—	—	33065	—	—	—	29824	66222
Maneb	—	4235	—	—	—	6000	—	—	—	4418	—	33218	—	—	5031	5016	57918
Metiram	—	—	—	—	—	—	—	—	—	—	5128	—	—	6918	—	—	12046
Totals	200	11558	—	370	—	26166	—	—	—	4418	10416	66735	2014	10377	5031	83253	220538
Herbicides																	
Alachlor	—	11	—	—	—	—	—	—	—	—	—	1161	—	—	1220	—	2392
Atrazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1777	—	1777
Bentazon	—	—	—	—	—	—	—	125	—	—	—	—	—	—	—	—	125
Butylate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2839	—	2839
CDAA	—	—	—	—	—	—	—	—	—	1933	—	—	—	—	—	—	1933
Chloramben	—	—	—	—	—	—	—	1453	—	—	—	—	245	4368	—	2821	8887
Chlorpropham	—	—	—	—	—	—	—	—	—	1657	—	—	—	—	—	—	1657
Cyanazine	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3325	—	3325
DCPA	—	—	—	—	—	—	156	—	—	—	—	—	—	—	—	—	156
Dinoseb	—	—	—	—	—	—	—	—	—	—	—	134	—	—	—	—	134
Diquat	—	—	—	—	—	—	—	—	—	—	—	269	—	—	—	—	269
EPTC	—	—	—	—	—	—	—	—	—	—	—	8349	—	—	—	—	8349
Glyphosate	—	—	—	—	—	—	—	—	—	—	—	1806	—	—	—	—	1806
Linuron	—	—	—	—	—	—	—	—	—	—	—	1712	—	—	—	—	1712
Metolachlor	—	—	—	—	—	—	—	—	—	—	—	538	—	—	1132	—	1670
Metribuzin	—	—	—	—	—	—	—	—	—	—	—	918	—	—	—	2348	3266
Napropamide	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	118	118
Naptalam	—	—	—	—	—	5000	—	—	—	—	—	—	—	—	—	—	5000
Paraquat	—	—	—	—	—	—	—	—	—	—	—	11	—	—	—	—	11
Pebulate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1176	1176
Sethoxydim	—	—	—	—	—	—	—	—	—	552	—	—	—	—	—	—	552
Trifluralin	7	358	—	25	—	—	—	—	—	—	647	—	—	—	—	2009	3046
Totals	7	369	—	25	—	5000	156	1578	—	4142	647	14898	245	4368	10293	8472	50200
Insecticides																	
Acephate	—	—	—	—	—	—	—	—	—	—	2459	—	—	—	—	—	2459
Aldicarb	—	—	—	—	—	—	—	—	—	—	—	19603	—	—	—	—	19603
Azinphosmethyl	50	1654	—	93	—	—	—	—	—	—	—	722	—	—	—	30	2549
B.T.	—	5283	—	3469	2727	—	—	—	645	—	—	—	—	—	—	4809	16933
Carbaryl	—	44	12000	—	—	12417	415	619	—	—	577	20767	4118	—	16924	198723	266604
Carbofuran	—	—	—	—	—	—	—	—	—	—	—	4780	—	—	311	—	5091
Diazinon	—	—	—	—	1818	—	—	—	323	—	—	4301	—	—	473	—	6915
Dicofol	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	66	66
Dimethoate	—	—	—	—	—	—	—	—	—	—	—	382	—	—	—	—	382
Endosulfan	—	—	—	—	—	3125	—	—	—	—	1282	—	2549	3459	—	4259	14674
Fenvalerate	67	1350	—	49	—	—	—	—	—	—	—	642	—	—	1669	389	4166
Fonofos	—	—	—	—	—	—	—	—	—	—	—	9204	—	—	629	—	9833
Malathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	472	—	472
Methamidophos	—	2316	—	—	—	—	—	—	—	—	—	11898	—	—	—	9608	23822
Methomyl	—	147	—	101	—	—	—	—	—	—	35	—	—	—	9453	3160	12896
Methyl parathion	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6247	—	6247
Mevinphos	—	—	—	—	227	—	—	—	—	—	—	—	—	—	—	—	227
Oxamyl	—	—	—	—	—	—	—	—	—	—	—	3126	—	—	—	—	3126
Oxydemeton-methyl	—	46	—	—	—	—	—	—	—	—	16	—	49	—	2060	—	2171
Parathion	67	1838	25	123	909	—	—	—	—	1381	962	1402	—	1730	5111	—	13548
Permethrin	—	44	—	—	—	—	—	—	—	—	—	3486	—	—	88	—	3618
Phorate	—	—	—	—	—	—	—	—	—	—	—	3226	—	—	—	—	3226
Phosmet	—	—	—	—	—	—	—	—	—	—	—	629	—	—	—	—	629
Totals	184	12722	12025	3835	5681	15542	415	619	968	1381	5331	84168	6716	5189	43437	221044	419257
Other																	
Ethephon	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1795	1795
MH-30	—	—	—	—	—	—	—	—	—	—	—	2290	—	—	—	—	2290
Total	—	—	—	—	—	—	—	—	—	—	—	2290	—	—	—	1795	4085

Table 8. Percent of Pesticide Application by Various Techniques

Crop	Application			Type and Method of Application[1]											
	Self	Commercial	Not Specified	Aerial	Ground	Dilute	LV Spray	Fog	Irrigation	Soil Fumigation	Broadcast	Band	Spot	Other	Not Specified
Apples															
Fungicides	89	—	11	—	100	66	29	—	—	1	8	—	—	1	16
Herbicides	58	—	42	—	100	71	29	—	—	—	29	29	—	—	58
Insecticides	89	—	10	—	97	60	28	1	—	—	9	3	1	1	27
Other	57	—	43	—	100	—	33	—	—	—	33	—	—	—	71
Cane Berries															
Fungicides	100	—	—	—	100	80	—	—	—	—	50	—	—	—	10
Herbicides	100	—	—	—	100	42	—	—	—	—	21	21	11	—	50
Insecticides	100	—	—	—	100	100	—	—	—	—	100	—	—	—	—
Cherries															
All pesticides	100	—	—	—	100	42	67	—	—	—	58	—	—	—	—
Grapes															
Fungicides	90	—	10	—	100	54	41	—	—	—	30	—	—	—	11
Herbicides	100	—	—	—	100	50	—	—	—	—	—	40	20	—	—
Insecticides	94	—	6	—	93	60	20	—	—	—	24	—	—	—	13
Melons															
Fungicides	67	22	11	22	67	33	—	—	—	—	22	11	—	—	56
Herbicides	100	—	—	—	100	100	—	—	—	—	100	—	—	—	—
Insecticides	92	—	—	8	82	36	—	—	—	—	45	9	—	—	55
Non-Bearing Orchard															
Fungicides	100	—	—	—	100	100	—	—	—	—	—	50	—	—	—
Insecticides	100	—	—	—	100	100	—	—	—	—	—	33	—	—	—
Peaches															
Fungicides	94	—	6	—	100	76	14	—	—	—	17	—	—	—	17
Herbicides	83	—	17	—	100	100	—	—	—	—	—	50	—	—	17
Insecticides	83	—	17	—	100	60	30	—	—	—	15	—	5	—	20
Pears															
Fungicides	100	—	—	—	100	67	33	—	—	—	67	—	—	—	—
Herbicides	100	—	—	—	100	100	—	—	—	—	—	100	—	—	—
Insecticides	100	—	—	—	100	56	33	11	—	—	44	—	—	—	—
Plums															
Fungicides	100	—	—	—	100	60	—	20	—	—	60	—	—	—	20
Herbicides	100	—	—	—	100	100	—	—	—	—	—	33	—	—	—
Insecticides	100	—	—	—	100	50	—	—	—	—	50	—	25	—	25
Strawberries															
Fungicides	79	8	13	8	90	57	—	—	48	—	29	—	—	—	19
Herbicides	88	—	12	—	100	71	—	—	—	—	64	—	—	—	14
Insecticides	93	—	7	—	100	38	—	—	62	8	15	—	—	—	8
Other	25	75	—	—	100	—	—	—	—	75	25	—	25	—	—
Small Vegetables[2]															
Fungicides	80	20	—	—	100	50	20	—	—	—	70	—	—	—	—
Herbicides	89	—	11	—	100	50	—	—	—	—	38	13	13	—	13
Insecticides	6	31	9	9	94	66	6	—	—	—	69	3	—	—	13
Cabbage															
Fungicides	75	25	—	—	100	100	—	—	—	—	50	—	—	—	—
Herbicides	50	—	50	—	50	50	—	—	—	—	50	—	—	—	50
Insecticides	50	22	28	—	100	77	15	—	—	—	77	15	—	—	23
Peppers and Tomatoes															
Fungicides	84	8	8	—	100	50	12	12	—	—	71	6	—	—	12
Herbicides	67	19	14	6	94	44	—	—	—	—	66	22	—	—	6
Insecticides	61	34	5	29	71	69	7	2	—	—	62	10	—	—	12
Potatoes															
Fungicides	73	20	7	21	79	86	—	—	—	—	29	—	—	—	21
Herbicides	94	—	6	—	100	82	6	—	—	—	29	6	—	—	18
Insecticides	84	14	2	17	83	71	—	—	—	—	24	17	—	—	10
Sweet Corn															
Fungicides	100	—	—	—	100	100	—	—	—	—	—	—	—	—	—
Herbicides	80	—	20	—	100	25	6	—	—	13	63	—	—	—	38
Insecticides	80	13	7	7	88	63	12	2	2	—	21	12	—	—	26
Vine Vegetables[3]															
Fungicides	44	44	11	—	86	75	—	—	—	—	63	—	—	—	13
Herbicides	33	33	33	—	100	100	—	—	—	—	100	—	—	—	—
Insecticides	64	29	7	—	100	69	—	—	—	—	77	—	—	—	8

[1] Percentages are calculated from the response of those who reported the use of self and/or commercial application. The sum of percentages for methods of application may exceed 100 because of more than one method being reported by some respondents.
[2] Includes beans, broccoli, carrots, cauliflower, celery, eggplant, greens, onions, peas and miscellaneous vegetables.
[3] Includes cucumbers, pumpkins and squash.

Table 9. Major Disease Problems Indicated by Vegetable Growers for Which Fungicides Were Applied

Major Disease Problem	Percent of Fungicide Use Applied for Control of Specific Diseases							
	Benomyl	Captafol	Captan	Chlorothalonil	Copper	Mancozeb	Maneb	Metiram
Angular leaf spot	—	—	—	—	6	—	—	—
Anthracnose	—	29	—	18	—	10	—	—
Bacterial blight	—	14	50	—	—	10	—	—
Bacterial spot	—	14	—	—	29	5	—	—
Black rot	—	—	50	—	23	—	20	—
Blight (early and late)	25	14	—	18	6	45	30	—
Botrytis	25	—	—	—	—	—	—	—
Downy mildew	—	—	—	—	—	5	10	—
Fruit rot	—	—	50	—	—	—	—	—
Leaf blight	—	—	—	—	—	—	10	—
Root rot	—	14	—	—	—	—	—	50
Rust	—	14	—	—	—	—	—	—
Scab	—	—	—	—	—	—	—	50
Not specified	50	29	—	73	35	40	30	—
No. of applications	1-7	2-6	4-5	3-13	1-16	2-16	3-12	5
Appli. rate (lb/ac)	.25-1.05	.8-2.5	1.5-2.0	.83-2.25	.25-5.0	1.5-2.4	1.0-2.0	1.6-2.0

Table 10. Major Disease Problems of Tree Fruits for Which Growers Applied Fungicides

Disease Problems	Percent of Fungicide Use Applied for Control of Specific Disease																	
	Benomyl	Captafol	Captan	Copper	Dichlone	Dikar[1]	Dodine	Ferbam	Folpet	Glyodin	Mancozeb	Maneb	Metiram	Strep[2]	Sulfur	Thiop[3]	Thiram	Zineb
Angular leaf spot	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—
Bacterial spot	3	—	2	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—
Black rot	—	—	7	—	—	9	—	—	—	—	—	—	—	—	—	—	—	—
Blotch	—	—	5	—	—	18	—	—	—	—	40	—	—	—	—	—	—	—
Brooks rot	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Brown rot	24	—	11	—	100	9	6	—	—	—	—	—	—	—	36	—	100[a]	14
Cedar apple rust	—	—	2	—	—	—	3	—	—	—	—	—	—	—	—	—	—	14
Downey mildew	—	—	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—
Fireblight	—	—	—	50	—	—	—	—	—	—	—	—	—	92	—	—	—	—
Fly speck	3	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14
Fruit rot	—	—	5	—	—	18	—	—	50[b]	—	—	—	—	—	—	—	—	43
Leaf curl	—	—	—	—	—	—	—	67	—	—	—	—	—	—	—	—	—	—
Powdery mildew	14	—	2	—	—	36	3	—	—	—	20	—	—	—	27	—	—	—
Rust	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14
Scab	31	67	77	—	—	64	69	—	50[b]	33	60	—	82	—	36	—	—	—
Sooty blotch	7	—	—	—	—	—	—	—	50[b]	—	—	—	—	—	—	—	—	14
Wirestem	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Not specified	38	33	20	50	—	8	19	33	—	67	—	100[a]	18	8	27	100[a]	—	—
No. of appli.	1-14	1-4	2-15	1-2	1-5	2-14	1-20	1-4	2-6	3-14	1-10	8	1-14	1-13	1-14	8	2	2-15
Appli. rate (lb/ac)	.09-2.0	4.4-6.7	.4-4.0	.5-9.0	.3-.5	.36-4.9	.24-1.63	.38-3.6	.5-3.0	.25-.5	.8-4.0	1.0	1.2-6.9	.06-4.0	1.96-11.52	.13	6.5	.75-3.0

[1] Combination product of mancozeb and karathane.
[2] Streptomycin.
[3] Thiophanate-methyl.
[a] Percentage based on only one report.
[b] Percentage based on only two reports.

Table 11. Major Disease Problems of Bramble, Bush and Ground Fruits for Which Growers Applied Fungicides

Disease Problem	Percent of Fungicide Use Applied for Control of Specific Disease													
	Benomyl	Bentazon	Bordeaux	Captan	Chlorothalonil	Copper	Ferbam	Folbam	Lime	Mancozeb	Maneb	Methyl Bromide	Sulfur	Triforine
Bramble and Cane Berries														
Anthracnose	50[b]	—	—	50	—	—	—	—	—	—	—	—	50[b]	—
Botrytis	50[b]	—	—	—	—	—	—	—	—	—	—	—	—	—
Cane blight	—	—	—	50	—	—	—	—	—	—	—	—	50[b]	—
Mummy berry	—	—	—	—	—	—	—	—	—	—	—	—	—	100[a]
Spur blight	100[b]	—	—	—	—	—	—	—	—	—	—	—	50[b]	—
Not specified	—	—	—	50	—	—	—	—	—	—	—	100[a]	—	—
Grapes														
Anthracnose	—	—	—	—	—	—	10	—	—	—	—	—	—	—
Black rot	67	—	—	50	—	—	40	14	—	50[b]	100[a]	—	—	—
Botrytis	—	100[a]	—	—	—	—	—	—	—	—	—	—	—	—
Brown rot	—	—	—	—	—	—	—	14	—	—	—	—	—	—
Dead arm	—	—	—	25	—	—	—	—	—	—	—	—	—	—
Downy mildew	—	—	—	—	—	33	—	57	—	50[b]	100[a]	—	—	—
Phomopsis	—	—	—	8	—	—	—	—	—	—	—	—	—	—
Powdery mildew	33	—	—	17	—	33	—	43	100[a]	—	—	—	100[a]	—
Wirestem	—	—	—	—	—	—	10	—	—	—	—	—	—	—
Not specified	33	—	100[a]	25	—	33	50	28	—	—	—	—	—	—
Melons														
Angular leaf spot	—	—	—	—	33	—	—	—	—	—	—	—	—	—
Anthracnose	—	—	—	—	33	—	—	—	—	—	—	—	—	—
Bacterial blight	—	—	—	—	—	—	—	—	—	100[a]	—	—	—	—
Blight (early & late)	—	—	—	—	17	—	—	—	—	—	—	—	—	—
Downy mildew	—	—	—	—	17	—	—	—	—	—	—	—	—	—
Powdery mildew	100[b]	—	—	—	—	—	—	—	—	—	—	—	—	—
Not specified	—	—	—	—	33	—	—	—	—	—	100[a]	—	—	—
Strawberries														
Bacterial spot	15	—	—	18	—	—	—	—	—	—	—	—	—	—
Blotch	—	—	—	9	—	—	—	—	—	—	—	—	—	—
Botrytis	15	—	—	9	—	—	—	—	—	—	—	—	—	—
Fruit rot	31	—	—	36	—	—	—	—	—	—	—	—	—	—
Scorch	8	—	—	9	—	—	—	—	—	—	—	—	—	—
Not specified	38	—	—	27	—	—	—	—	—	—	—	—	—	—
No. of applications	5-12	12	2	1-12	4-10	1-2	2-10	2-10	1	3-12	1-5	2	1-12	1
Appli. rate (lb/ac)	.125-3.0	.125	2.0	.63-4.57	1.0-4.0	1.0-2.1	1.5-3.0	1.0-2.0	8.0	.8-2.7	1.2-1.6	98.0	2.3-60	.3

[a] Percentage based on only one report.
[b] Percentage based on only two reports.

Table 12. Major Weed Problems Indicated by Fruit Growers for Which Herbicides Were Applied

Herbicide			Percent of Respondents Reporting Major Weed Problem						
Name	No. of Applications	Application Rate (lb/ac)	General Weeds	Broadleaf Weeds	Grasses	Thistle	Milkweed	Morning Glory	Not Specified
Bensulide[a]	1	5.0	100	—	—	—	—	—	—
Chloroxuran	1	3.0-4.0	33	33	33	—	—	—	—
2,4-D	1	1.0-2.0	—	50	—	—	—	—	50
DCPA	1	6.0-9.0	—	—	50	—	—	—	50
Dinoseb[a]	1	1.0	—	—	—	—	—	—	100
Diphenamid	1	3.96-5.0	25	25	25	—	—	—	25
Diuron	1-2	0.8-1.92	50	—	17	—	—	—	33
Glyphosate	1-8	0.7-3.0	40	—	—	20	20	20	40
Napropamide	1	2.0-4.0	44	11	—	—	—	—	44
Naptalam[a]	1	3.0	100	—	—	—	—	—	—
Oryzalin	1	2.63-3.0	33	—	—	—	—	—	67
Paraquat	1-4	0.125-2.0	65	—	—	—	—	—	35
Simazine	1-2	1.6-3.2	40	—	—	—	—	—	60
Terbacil	1-2	0.25-1.2	50	—	—	—	—	—	50

[a] Percentage based on only one report.

Table 13. Major Weed Problems Indicated by Vegetable Growers for Which Herbicides Were Applied

Herbicide			Percent of Respondents Reporting Major Weed Problem							
Name	No. of Applications During Year	Application Rate (lb/ac)	General Weeds	Broadleaf Weeds	Grasses	Nightshade	Nutsedge	Thistle	Vine Kill	None Specified
Alachlor	1	2.0	57	—	14	—	—	—	—	29
Atrazine	1	.53-1.6	25	25	25	—	—	—	—	50
Bentazon[a]	1	1.0	—	—	—	—	—	100	—	—
Butylate	1	3.0-5.0	33	—	—	—	—	—	—	67
CDAA	1	3.5	—	—	—	—	—	—	—	100
Chloramben	1-10[b]	1.2-6.0	11	—	22	22	—	—	—	56
Chlorpropham[a]	1	3.0	—	—	—	—	—	—	—	100
Cyanazine	1	1.0-1.75	33	33	11	—	—	—	—	33
DCPA	1	3.0	—	—	—	—	—	—	—	100
Dinoseb[a]	1	2.5	—	—	—	—	—	—	100	—
Diquat[a]	1	0.25	—	—	—	—	—	—	100	—
EPTC	1	4.0-5.25	67	—	—	—	—	—	—	33
Glyphosate	1	1.15-3.0	—	—	50	—	—	—	—	50
Linuron	1	0.5-1.5	100	—	—	—	—	—	—	—
Metolachlor	1	1.8-2.0	—	—	50	—	—	—	—	50
Metribuzin	1-8	0.19-0.75	17	33	8	—	—	—	—	50
Napropamide[a]	1	1.5	—	—	—	—	—	—	—	100
Naptalam[a]	1	3.0	—	—	—	—	—	—	—	100
Paraquat[a]	1	0.5	—	—	—	—	—	—	—	100
Pebulate	1	3.0-4.5	—	—	—	—	50	—	—	50
Sethoxydim[a]	2	0.5	—	—	—	—	—	—	—	100
Trifluralin	1	0.5-1.0	8	—	33	—	—	—	—	58

[a] Percentage based on only one report.
[b] One report of five applications and one of 10 applications. All others one application.

Table 14. Major Insect Problems on Vegetables for Which Growers Applied Insecticides

Vegetables	Percent of Insecticide Use Applied for Control of Specific Insects											
Insects[a]	Azinphos-methyl	B.T.	Carbaryl	Diazinon	Endosulfan	Fenvalerate	Malathion	Methomyl	Mevinphos	Oxydemeton-methyl	Parathion	Permethrin
Cabbage looper	17	46	—	—	—	83	—	25	—	—	—	—
Colorado potato beetle	—	—	7	—	—	—	—	—	—	—	—	—
Cucumber beetle	—	—	27	50[b]	20	—	—	—	—	—	—	—
Cutworms	—	—	—	50[b]	—	—	—	—	—	—	—	—
Flea beetle	—	—	13	—	—	—	—	—	—	—	—	—
Japanese beetle	—	—	7	—	20	—	—	—	—	—	—	—
Leafhoppers	—	—	13	50[b]	—	—	—	—	—	—	—	—
Mexican bean beetle	—	—	7	—	—	—	—	—	—	—	—	—
Squash beetle	—	—	—	—	20	—	—	—	—	—	—	—
Tarnish plant bug	—	—	—	—	—	—	—	—	100[d]	—	—	—
Thrips	—	—	—	—	20	—	—	—	—	—	43	—
Vine borer	—	—	—	—	—	—	—	—	—	—	14	—
Wireworms	—	—	—	50[b]	—	—	—	—	—	—	14	—
Unspecified aphids	—	—	7	—	—	—	—	—	—	100[e]	—	—
Unspecified insects	—	—	—	—	—	—	50[c]	—	—	—	14	—
Unspecified mites	—	—	—	—	—	—	—	—	—	—	14	—
Unspecified weevils	—	—	—	—	—	—	—	—	—	—	14	—
Unspecified worms and loopers	50	23	—	—	—	17	—	—	—	—	—	—
Not specified	33	31	20	—	20	—	50[c]	75	—	—	14	100[f]
No. of applications	2-6	2-10	2-10	1-4[b]	1-5	1-16	5-6[c]	2-6	2[d]	1[e]	2-5	8[f]
Application rate (lb/ac)	.5-.75	.5-3.0	.75-2.0	.5-4.[b]	.5-1.0	.1-.2	.6-1.0[c]	.25-.34	.25[d]	.5[e]	.5-1.0	.15[f]

Table 14. Major Insect Problems on Vegetables for Which Growers Applied Insecticides—Continued

Peppers & Tomatoes	Percent of Insecticide Use Applied for Control of Specific Insects										
Insects	Acephate	Azinphosmethyl	B.T.	Carbaryl	Dicofol	Endosulfan	Fenvalerate	Methamidophos	Methomyl	Oxydemetonmethyl	Parathion
Beetle grubs	—	—	—	—	—	14	—	—	—	—	—
Cabbage looper	—	—	—	—	—	—	50[g]	33	—	—	—
Colorado potato beetle	—	—	—	35	—	14	—	—	—	—	—
Corn earworm	33	—	—	—	—	—	—	—	—	—	—
Crown borer	33	—	—	—	—	—	—	—	—	—	—
Cutworm	—	—	—	6	—	—	—	67	50	—	—
European corn borer	33	—	—	6	—	—	—	—	—	—	—
Flea beetle	—	—	—	18	—	—	—	—	—	—	—
Fruitworm	—	—	—	35	—	—	—	—	—	—	—
Hornworm	—	50[g]	—	35	—	—	—	—	—	—	—
Leafhopper	—	—	—	6	—	—	—	—	—	—	100[i]
Stink bug	—	—	—	—	—	14	—	—	—	—	—
Unspecified aphids	—	50[g]	—	—	—	28	—	67	17	100[i]	—
Unspecified mites	—	—	—	—	100[h]	—	—	—	—	—	—
Unspecified worms and loopers	—	—	100[g]	—	—	—	—	—	—	—	—
Not specified	—	50[g]	—	12	—	43	50[g]	—	33	—	—
No. of applications	2-5	6-8	1	1-6	1	1-12	1	1-2	2-6	1	3
Application rate (lb/acre)	.37-.75	.25-.50	1.0-3.0	.75-3.0	.7	.4-1.0	.1-.45	.5-1.0	.22-.9	.5	.5

Potatoes	Aldicarb	Azinphosmethyl	Carbaryl	Carbofuran	Diazinon	Dimethoate	Fenvalerate	Fonofos	Methamidophos	Oxamyl	Parathion	Permethrin	Phorate	Phosmet
Apple aphid	—	—	17	—	—	—	—	—	—	—	—	—	—	—
Colorado potato beetle	43	33	50	25	—	—	50[k]	—	—	50[k]	50[k]	—	—	—
Flea beetle	43	33	—	13	—	—	—	—	—	—	—	—	100[j]	—
Leafhopper	14	33	33	—	—	100[j]	50[k]	—	—	—	—	—	—	—
Nematodes	29	—	—	—	—	—	—	—	—	—	—	—	100[j]	—
Sap beetle	—	—	—	—	—	—	—	—	14	—	—	—	—	—
Wireworm	—	—	—	—	100[j]	—	—	—	—	—	—	—	—	—
Unspecified aphids	29	—	—	—	—	—	—	—	71	50[k]	—	—	—	—
Unspecified insects	—	33	17	38	—	—	—	—	14	—	—	—	—	100[j]
Not specified	14	33	17	38	—	—	—	100[j]	14	50[k]	50[k]	100[k]	—	—
No. of applications	1-2	2-6	1-7	1-5	1	1	1-2	4	1-6	1-6	1-3	3-8	1	6
Application rate (lb/ac)	1.6-3.0	.34-.5	.75-1.6	.2-3.0	2.0	.5	.1-.12	4.0	.5-1.0	.75-1.0	.75-1.0	.2-2.0	3	.5

Sweet Corn	Carbaryl	Carbofuran	Diazinon	Fenvalerate	Fonofos	Malathion	Methomyl	Oxydemetonmethyl	Parathion	Permethrin
Apple aphid	—	—	—	—	—	—	—	—	7	—
Armyworm	5	—	—	—	—	—	—	—	7	—
Corn earworm	59	—	50[m]	80	—	100[l]	60	—	67	—
Crown borer	14	—	—	40	—	—	—	—	17	—
European corn borer	14	—	50[m]	20	—	—	20	33	7	—
Flea beetle	9	—	—	—	—	—	—	—	—	—
Japanese beetle	5	—	—	—	—	—	—	—	—	—
Rootworm	—	100[l]	—	—	—	—	—	—	—	—
Sap beetle	5	—	—	—	—	—	—	—	—	—
Unspecified aphids	9	—	50[m]	—	—	100[l]	—	67	—	—
Not specified	9	—	—	—	100[l]	—	40	—	7	100[l]
No. of applications	1-6	1	1-3	1-15	1	3	3-5	1	3-6	4
Application rate (lb/acre)	.75-3.0	2.25	.25-1.0	.1-.48	1.0	1.0	.34-.45	.5	.4-.75	.1

[a] Includes beans, broccoli, cabbage, carrots, cauliflower, celery, cucumbers, eggplant, greens, onions, pumpkins and squash.
[b] Based on two reports for diazinon use; once on celery and once on greens.
[c] Based on two reports on vegetables.
[d] Based on one report on celery.
[e] Based on one report on pumpkins.
[f] Based on one report on cabbage.
[g] Based on two reports on tomatoes.
[h] Based on one report on tomatoes.
[i] Based on one report on peppers.
[j] Based on one report on potatoes.
[k] Based on two reports on potatoes.
[l] Based on one report on corn.
[m] Based on two reports on corn.

Table 15. Major Insect Problems on Tree Fruits for Which Growers Applied Insecticides

Insecticide	Percent of Insecticide Use Applied for Specific Insects														
	Aphids[a]	Codling Moth[b]	Fruit Flies	Leafminer	Leafroller	Mites[c]	Peach Tree Borer	Pear Psylla	Plum Curculio	Scale[d]	Insects General	Other[e]	Not Indicated	No. of Applications	Rate of Application Range (lb/acre)
Amitraz	—	—	—	—	—	—	—	—	—	—	—	—	100[f]	6	0.75
Azinphosmethyl	12	29	—	—	7	5	—	—	14	5	7	17	29	1-15	0.2-3.0
Carbaryl	—	38	5	—	5	—	—	—	5	5	5	14	29	1-14	0.5-3.0
Chlorpyrifos	—	—	—	—	—	—	—	—	—	—	100[g]	—	—	1	0.13
Cyhexatin	—	—	—	8	—	77	—	—	—	—	—	—	31	1-14	0.13-.56
Demeton	100[g]	—	—	—	—	—	—	—	—	—	—	—	—	2	1.5
Diazinon	—	33	—	—	—	—	—	—	—	33	—	—	33	1-8	2.0-3.0
Dicofol	—	—	—	—	—	100	—	—	—	—	—	—	—	2-5	0.35-1.9
Dimethoate	100[g]	—	—	—	—	—	—	—	—	—	—	—	—	1	3.5
Dinocap	50[h]	50[h]	—	17	—	—	—	—	—	—	50[h]	50[h]	—	3-8	0.36-4.62
Endosulfan	33	—	—	—	—	—	17	—	—	—	—	33	17	1-8	0.5-1.75
Ethion	—	—	—	—	25	50	—	—	—	50	—	—	—	1-13	0.3-1.0
Fenbutatin-oxide	—	—	—	—	—	100[g]	—	—	—	—	—	—	—	12	0.75
Fenvalerate	—	—	—	—	—	—	—	—	—	—	33	—	67	1-14	0.15-0.3
Malathion	—	—	—	—	—	—	—	—	—	—	—	—	100[g]	10	1.0
Methomyl	—	—	—	—	—	—	—	—	—	—	—	33	67	2-14	0.68-0.75
Oil	—	—	—	4	4	60	—	4	—	32	12	—	20	1-12	2.0-6.0 gal
Oxamyl	—	—	—	100[i]	—	—	—	—	—	—	—	—	—	1-6	0.57-0.6
Parathion	30	10	—	—	—	—	20	—	30	—	—	10	20	3-10	0.15-1.6
Permethrin	—	—	—	—	—	—	—	100[f]	—	—	—	—	—	5	0.96
Phosalone	67	—	—	—	—	—	—	—	—	—	22	—	—	1-14	1.5-3.0
Phosmet	4	50	5	2	4	—	—	2	16	—	11	16	25	1-20	0.4-4.0
Propargite	—	—	—	—	—	100[i]	—	—	—	—	—	—	—	1-3	0.23-0.83
Tetradifon	—	—	—	—	—	100[i]	—	—	—	—	—	—	—	2-10	0.8-1.28

[a] Includes apple aphid and general aphids.
[b] Includes apple maggot.
[c] Includes European red mite and general mites.
[d] Includes San Jose scale and general scale.
[e] Includes unspecified worms and loopers, Japanese beetles, nematodes, tarnish plant bug, leafhoppers, stink bug, blister beetle, beetle grubs and plant bugs.
[f] One report on pears.
[g] One report on apples.
[h] Two reports—one on apples and one on peaches.
[i] Two reports on apples.

Table 16. Major Insect Problems on Vine, Bush and Bramble Fruits for Which Growers Applied Insecticides

Insecticide	Percent of Insecticide Use Applied for Specific Insects												
	Berry Moth	Cucumber Beetle	Flea Beetle	Japanese Beetle	Leafhopper	Leafroller	Spittlebug	Tarnish Plant Bug	Insects General	Other[a]	Not Specified	No. of Applications	Rate of Application Range (lb/acre)
Azinphosmethyl	—	9	—	—	18	9	—	9	—	18	36	1-8	0.25-1.5
Carbaryl	14	10	5	10	14	—	—	—	19	19	33	1-10	1.0-3.0
Carbofuran	—	—	—	—	—	—	—	—	—	—	100[b]	1	1.2-2.1
Dicofol	—	—	—	—	—	—	—	—	—	—	100[c]	4-5	0.35
Dinocap	100[d]	—	—	—	—	—	—	—	—	—	—	2	0.46
Endosulfan	—	33	—	—	—	—	44	22	—	11	22	1-10	0.5-1.5
Fenvalerate	—	100[d]	—	—	—	—	—	—	—	—	—	10	0.24
Malathion	—	50	—	—	—	—	25	—	—	25	25	1-6	0.63-1.88
Methoxychlor	—	20	40	—	—	—	—	—	20	20	40	1-8	1.0-2.4
Methyl bromide	—	—	—	—	—	—	—	—	—	33	67	2	98
Oil	—	—	—	—	—	—	—	—	—	—	100[d]	1	2.0 gal
Parathion	38	—	—	—	25	13	—	—	25	—	25	1-4	0.22-1.2
Phosalone	—	—	—	—	—	—	—	—	—	100[d]	—	2	1.88
Phosmet	67	—	—	—	—	—	—	—	—	—	33	2-8	0.5-1.33

[a] Includes unspecified aphids, beetle grubs, blueberry maggot, cicada, codling moth, unspecified mites, nematodes, Phylloxera, plant bugs, sap beetles and strawberry weevil.
[b] One report on melons.
[c] Two reports—one on grapes and one on strawberries.
[d] One report on grapes.

Table 17. Percent of Pesticide Applicators Who Are Certified

Percent of responding sample reporting	88.5
Percent of applicators who are certified	91.4

Table 18. Personnel Involved in Pesticide Operations

Operation	Percent of Operators Involved with Activity
Mixing/loading and applying	76.1
Mixing/loading only	13.5
Application only	10.4
Percent of respondents answering question	84.0

Table 19. Percent of Pesticide Workers Involved in Operation

Number of Pesticide Operators on Farm	Percent of Farms with Number of Operators	Percent of Operators Involved in		
		All Operations	Mixing/ Loading Only	Application Only
9	0.9	33.3	33.3	33.3
8	0.9	37.5	37.5	25.0
7	0.9	57.1	28.6	14.3
6	1.8	41.6	33.3	25.0
5	1.8	40.0	40.0	20.0
4	4.5	45.0	25.0	30.0
3	15.5	74.5	13.7	11.8
2	29.1	93.8	4.7	1.5
1	44.5	100.0	0	0
Average for total		76.1	13.5	10.4
Percent of survey respondents answering question				84.0

Table 20. Percent of Growers Using Commercial Pesticide Application Services

Percent of Pesticide Application (No. of Growers)		Percent of Growers Using Service
100	(3)	2.7
90	(2)	1.8
75-80	(2)	1.8
25-30	(2)	1.8
20	(2)	1.8
10	(2)	1.8
5-10	(2)	1.8
0	(95)	86.3
Percent of respondents answering question		84.0

Table 21. Percent of Greenhouse Operators Whose Facilities Are Equipped for Soil Steam Sterilization

Greenhouses with steam sterilization	6.7%

Table 22. Pesticide Storage Facilities Practices Used by Growers

Type of Storage Facility/Practice	Percent Using
Stored in separate/exclusive building	52.2
Stored in building housing other materials	46.9
Separated by a barrier from other materials in building	23.0
Kept under locked storage	45.1
Storage area is fireproof	12.4
Storage area has fire protection	10.6
Storage area has temperature control	8.0
Storage area has air movement	35.4
Pesticides separated and segregated within storage area	31.9
Storage area is equipped with isolated drainage system	5.3
Storage area is accessible only to authorized persons	34.5
Pesticides are stored in other than the original container	0.9
Percent of survey returns responding to question	86.3

Table 23. Disposition of Surplus and Waste Pesticides

Type of Disposition	Percent Using
Surplus pesticide stored for next season	97.3
Surplus pesticide returned to dealer	15.5
Surplus pesticide applied for other labeled uses	11.8
Surplus pesticide diluted and sprayed in isolated areas	4.5
Surplus pesticide buried in isolated areas	6.4
Surplus pesticide burned or incinerated	1.8
Surplus pesticide disposed of in sanitary landfill	1.8
Surplus pesticide disposed of by commercial waste company	0.0
Surplus pesticide disposed of in public drainage system	0.0
Percent of survey returns responding to the question	84.0

Table 24. Disposal of Pesticide Containers

Type of Disposal	Grower Response (percent)
Containers triple-rinsed	78.6
Containers burned on premises	76.1
Containers buried on premises	17.9
Containers disposed of in sanitary landfill	40.2
Large containers returned to dealer	9.4
Containers disposed of through reclaimers	0.9
Containers disposed of through commercial waste disposal companies	10.3
Containers re-used for other purposes	3.4
Containers accumulated on premises	3.4
Containers dumped in out-of-way places	0
Containers stored for future use	6.0
Container storage facilities similar to pesticide storage	6.8
Percent of survey returns responding to the question	89.3

Table 25. Sources of Pesticide Information Used by Growers

Source of Primary Information	Grower Response (percent)
Cooperative Extension Service	64.2
Farm supply dealers	12.5
State Department of Agriculture	20.0
Media advertisements	0.8
Chemical company sales representatives	20.0
Commercial pesticide applicators	3.3
Crop consultants/scouts	6.7
Self and past experience	29.2
Neighbors and other producers	4.2
Percent of survey returns responding to the question	91.6
Source of Secondary Information	
Cooperative Extension Service	24.0
Farm supply dealers	14.0
State Department of Agriculture	16.0
Media advertisements	3.0
Chemical company sales representatives	24.0
Commercial pesticide applicators	0
Crop consultants/scouts	6.0
Self and past experience	18.0
Neighbors and other producers	3.0
Percent of survey returns responding to the question	76.3

Table 26. Effectiveness of Pest Control Program in 1983

Crop Group	Rating	Percent Reporting Control of Insects	Weeds	Diseases	Other
Fruit and vegetables	Excellent	47.4	16.7	50.0	–
	Good	42.1	55.6	22.2	a
	Satisfactory	5.2	27.8	16.7	–
	Fair	0	0	11.1	–
	Poor	5.2	0	0	–
Fruit	Excellent	36.1	16.3	21.1	b
	Good	45.9	39.5	38.6	b
	Satisfactory	11.5	34.9	15.8	b
	Fair	6.5	7.0	15.8	–
	Poor	0	2.3	8.8	b
Vegetables	Excellent	29.7	19.4	24.2	c
	Good	56.8	41.7	33.3	c
	Satisfactory	8.1	25.0	27.3	–
	Fair	5.4	13.9	15.2	–
	Poor	0	0	0	–
Percent of respondents answering question				89.3	

a Only one report.
b Only five reports—1-excellent, 2-good, 1-satisfactory, 1-poor.
c Only four reports—1-excellent, 3-good.

Table 27. Use of Protective Clothing and Gear by Pesticide Applicators

Pesticide (No. Reporting)	Percent of Applicators Reporting Using Items of Protective Clothing and Gear: Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Fungicides											
Benomyl (42)	29	31	—	29	71	19	19	5	38	2	2
Bordeaux (1)	—	—	—	—	—	—	—	—	—	—	—
Captafol (8)	38	50	—	13	63	—	50	25	12	12	38
Captan (63)	22	22	3	27	60	16	24	10	40	3	2
Chlorothalonil (8)	12	25	—	—	50	—	—	—	12	—	12
Copper (18)	11	33	—	—	28	—	6	6	11	—	22
Dikar (10)	30	30	10	30	40	20	30	20	30	10	10
Dinocap (3)	67	33	33	67	33	33	33	33	67	—	—
Dodine (34)	26	38	6	26	56	18	26	6	38	—	—
Ferbam (14)	29	14	—	21	57	21	14	7	21	—	—
Folpet (8)	50	12	—	25	50	13	—	12	38	—	—
Glyodin (2)	—	—	—	—	50	—	—	—	—	—	50
Mancozeb (24)	13	33	—	8	63	4	8	8	29	—	8
Maneb (11)	18	27	—	18	45	—	—	—	27	—	—
Metiram (11)	18	27	—	27	55	9	27	—	18	—	—
Sulfur (9)	22	11	—	33	67	11	22	—	22	—	—
Thiophanate-methyl (1)	100	100	—	—	—	—	—	—	—	—	—
Thiram (1)	—	—	—	—	100	—	100	—	—	—	—
Triadimefon (1)	100	—	—	100	100	100	100	—	100	—	—
Triforine (2)	—	—	—	50	100	—	—	—	—	—	—
Zineb (7)	29	43	14	57	57	14	29	14	43	14	—
Totals (278)	24	28	3	23	57	13	19	8	31	2	5
Herbicides											
2,4-D (2)	—	50	—	—	50	—	—	—	100	—	—
Alachlor (7)	43	43	—	—	71	—	—	14	—	—	14
Atrazine (5)	—	20	—	—	40	—	—	—	—	—	—
Bensulide (1)	—	—	—	—	100	—	—	—	—	—	—
Bentazon (1)	100	100	—	—	—	—	—	—	—	—	—
Butylate (2)	50	—	—	—	50	—	—	—	—	—	—
CDAA (1)	—	—	—	—	—	—	—	—	—	—	—
Chloramben (6)	67	50	—	—	33	—	—	17	17	—	—
Chloroxuron (2)	—	50	—	—	—	—	—	—	50	—	—
Chlorpropham (1)	—	—	—	—	—	—	—	—	—	—	—
Cyanazine (6)	17	17	—	—	83	—	—	—	17	—	—
DCPA (3)	—	—	—	—	67	—	—	—	67	—	—

Table 27. Use of Protective Clothing and Gear by Pesticide Applicators—Continued

Pesticide (No. Reporting)	Percent of Applicators Reporting Using Items of Protective Clothing and Gear										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Herbicides—continued											
Dinoseb (3)	33	33	—	67	67	33	67	—	33	—	—
Diphenamid (3)	—	33	—	33	67	—	—	—	67	—	—
Diquat (1)	—	—	—	—	100	—	—	—	—	—	—
Diuron (5)	20	—	—	—	60	—	—	20	20	—	—
EPTC (3)	—	—	—	—	67	—	—	33	—	—	—
Glyphosate (9)	11	11	—	22	44	11	11	—	33	—	—
Linuron (3)	—	—	—	—	100	—	—	—	33	—	—
Metolachlor (3)	—	—	—	—	67	—	—	—	—	—	—
Metribuzin (11)	27	45	—	18	45	—	—	9	—	—	9
Napropamide (8)	25	13	—	13	63	—	13	—	38	—	—
Naptalam (1)	—	—	—	—	100	—	—	—	—	—	—
Oryzalin (2)	—	—	—	—	50	—	—	—	—	—	50
Pebulate (2)	50	100	—	—	—	—	—	50	—	—	50
Paraquat (14)	57	43	—	36	50	7	21	7	29	—	7
Sethoxydim (1)	—	—	—	—	—	—	—	—	—	—	—
Simazine (8)	12	12	—	12	63	—	—	—	25	—	—
Terbacil (6)	33	—	—	17	83	—	17	—	17	—	—
Trifluralin (5)	40	60	—	—	40	—	—	20	—	—	20
Totals (125)	26	26	0	12	56	2	6	6	21	—	4
Insecticides											
Acephate (2)	—	—	—	—	50	—	—	—	—	—	50
Aldicarb (6)	17	33	—	17	67	—	—	—	—	—	—
Amitraz (1)	100	100	—	100	—	—	—	—	100	—	—
Azinphosmethyl (52)	50	50	4	42	62	25	38	8	46	8	6
B.T. (6)	33	17	—	17	67	17	17	—	33	—	17
Carbaryl (83)	37	42	5	22	61	22	27	10	36	1	6
Carbofuran (7)	29	29	—	29	71	14	29	—	14	—	—
Chlorpyrifos (1)	—	—	—	—	—	—	—	—	—	—	—
Cyhexatin (12)	42	42	—	33	33	17	33	—	42	—	8
Demeton (2)	100	100	—	100	50	100	100	—	50	—	—
Diazinon (8)	38	25	—	13	75	13	25	—	25	—	13
Dichlone (3)	—	—	—	—	67	—	33	—	33	—	—
Dicofol (7)	14	57	—	14	57	14	14	—	29	—	—
Dimethoate (2)	—	—	—	—	50	—	—	—	—	—	—
Endosulfan (26)	35	69	4	23	73	15	35	12	38	—	15
Ethion (4)	50	50	—	—	75	25	25	50	50	—	—
Fenbutatin-oxide (1)	100	100	—	—	100	—	100	—	—	—	—
Fenvalerate (14)	21	43	—	—	50	—	7	—	21	—	36
Fonofos (2)	—	—	—	—	50	—	—	—	—	—	—
Formetanate hydrochloride (1)	—	—	—	—	100	—	—	—	—	—	—
Malathion (5)	60	100	—	20	100	40	60	—	60	—	—
Mercaptodimethur (2)	—	—	—	—	50	—	—	—	—	—	—
Methamidophos (7)	29	71	—	43	43	29	57	—	57		— 14
Methomyl (12)	33	58	—	50	50	67	50	—	58	17	25
Methoxychlor (5)	40	20	—	40	40	20	40	—	20	—	—
Mevinphos (1)	100	100	—	—	100	—	—	—	—	—	—
Oil (22)	18	18	—	9	50	9	14	5	27	—	5
Oxamyl (4)	25	—	—	25	50	—	—	—	25	—	—
Oxydemeton-methyl (3)	33	33	—	—	33	—	—	—	—	—	—
Parathion (25)	56	28	4	16	76	32	32	16	36	4	16
Permethrin (5)	80	60	—	80	60	80	20	—	80	—	—
Phorate (1)	100	—	—	—	100	—	—	—	—	—	—
Phosalone (5)	60	40	—	60	80	20	20	40	60	—	20
Phosmet (51)	41	55	2	33	61	29	39	12	41	2	6
Propargite (3)	—	—	—	33	67	33	67	—	33	—	—
Steptomycin (8)	25	38	13	25	63	13	25	13	38	—	—
Totals (399)	38	44	3	26	61	22	30	8	37	2	9
Other Pesticides											
Chloropicrin (2)	—	50	—	—	100	—	—	—	50	—	—
Daminozide (1)	—	—	—	—	—	—	—	—	—	—	—
Ethephon (1)	—	100	—	—	—	—	—	100	—	—	100
M.H. (2)	—	—	—	—	50	—	—	—	50	—	—
Zinc phosphate (1)	100	100	—	—	100	—	100	—	—	—	—
Totals (7)	14	43	0	0	57	0	14	14	29	0	14

Table 28. Use of Protective Clothing and Gear by Pesticide Mixers-Loaders

Pesticide (No. Reporting)	Percent of Mixers/Loaders Reporting Using Items of Protective Clothing and Gear										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Fungicides											
Benomyl (42)	26	40	—	26	62	5	10	12	17	—	—
Bordeaux (1)	—	—	—	—	—	—	—	—	—	—	—
Captafol (8)	50	38	—	13	38	—	13	13	—	—	—
Captan (63)	22	35	3	25	35	6	13	14	21	—	—
Chlorothalonil (8)	13	50	—	—	38	—	—	—	—	—	—
Copper (18)	17	39	—	—	22	—	—	—	17	—	—
Dikar (10)	40	60	10	40	40	20	30	20	20	—	—
Dinocap (3)	67	33	33	67	33	33	33	33	67	—	—
Dodine (34)	24	44	62	26	50	6	9	9	15	—	—
Ferbam (14)	21	29	—	29	64	—	7	7	14	—	—
Folpet (8)	38	38	—	38	40	—	—	13	25	—	—
Glyodin (2)	—	—	—	—	—	—	—	—	—	—	—
Mancozeb (24)	8	38	—	—	50	4	4	8	13	—	—
Maneb (11)	18	27	—	18	45	—	—	—	18	—	—
Metiram (11)	9	18	—	27	45	—	18	9	9	—	—
Sulfur (9)	33	22	—	22	67	11	11	11	11	—	—
Thiophanate-methyl (1)	100	100	—	—	—	—	—	—	—	—	—
Thiram (1)	—	—	—	—	100	—	100	—	—	—	—
Triadimefon (1)	100	—	—	—	—	100	—	—	—	—	—
Triforine (2)	—	—	—	50	50	—	—	—	—	—	—
Zineb (7)	43	43	14	43	57	14	43	14	43	—	—
Totals (278)	24	37	3	22	46	5	10	10	17	0	0
Herbicides											
2,4-D (2)	—	50	—	—	100	—	—	—	50	—	—
Alachlor (7)	—	14	—	—	29	—	—	—	14	—	—
Atrazine (5)	—	20	—	—	40	—	—	—	—	—	—
Bensulide (1)	—	—	—	—	—	—	—	—	—	—	—
Bentazon (1)	100	100	—	—	—	—	—	—	—	—	—
Butylate (2)	50	50	—	—	50	—	—	—	—	—	—
CDAA (1)	—	—	—	—	—	—	—	—	—	—	—
Chloramben (6)	67	83	—	—	33	—	—	—	—	—	—
Chloroxuron (2)	—	100	—	—	50	—	—	—	50	—	—
Chlorpropham (1)	—	—	—	—	—	—	—	—	—	—	—
Cyanazine (6)	17	33	—	—	67	—	—	—	17	—	—
DCPA (3)	—	—	—	—	67	—	—	—	—	—	—
Dinoseb (3)	67	67	—	33	33	33	33	—	—	—	—
Diphenamid (3)	—	67	—	33	67	—	33	—	33	—	—
Diquat (1)	—	—	—	—	100	—	—	—	—	—	—
Diuron (5)	20	20	—	—	40	—	—	20	40	—	—
EPTC (3)	—	—	—	—	67	—	—	33	—	—	—
Glyphosate (9)	11	22	—	—	33	11	—	—	11	—	—
Linuron (3)	—	—	—	—	100	—	—	—	33	—	—
Melolachlor (3)	—	—	—	—	33	—	—	—	—	—	—
Metribuzin (11)	27	64	—	—	27	—	—	—	—	—	—
Napropamide (8)	38	25	—	13	75	—	13	—	25	—	—
Naptalam (1)	—	—	—	—	—	—	—	—	—	—	—
Oryzalin (2)	—	—	—	—	—	—	—	—	—	—	—
Pebulate (2)	50	100	—	—	—	—	—	—	—	—	—
Paraquat (14)	64	64	—	36	57	—	14	7	29	—	—
Sethoxydim (1)	—	—	—	—	—	—	—	—	—	—	—
Simazine (8)	12	25	—	12	38	—	12	—	12	—	—
Terbacil (6)	33	17	—	17	67	—	—	—	—	—	—
Trifluralin (5)	40	80	—	—	20	—	—	—	—	—	—
Totals (125)	27	38	0	8	45	2	5	2	13	0	0
Insecticides											
Acephate (2)	—	—	—	—	—	—	—	—	—	—	—
Aldicarb (6)	17	33	—	17	67	—	—	—	—	—	—
Amitraz (1)	100	100	—	100	—	—	—	—	100	100	—
Azinphosmethyl (52)	48	56	2	40	56	13	35	12	31	8	—
B.T. (6)	33	33	17	17	67	17	17	—	17	—	—
Carbaryl (83)	31	41	5	18	48	10	12	7	17	1	—
Carbofuran (7)	14	29	—	14	43	14	29	—	—	—	—
Chlorpyrifos (1)	—	—	—	—	—	—	—	—	—	—	—
Cyhexatin (12)	42	42	—	25	33	—	17	17	17	8	—
Demeton (2)	100	100	—	100	50	50	50	—	50	—	—
Diazinon (8)	50	25	—	13	63	—	13	—	—	—	—
Dichlone (3)	33	—	—	—	100	—	67	—	33	—	—

Table 28. Use of Protective Clothing and Gear by Pesticide Mixers-Loaders—Continued

Pesticide (No. Reporting)	Percent of Mixers/Loaders Reporting Using Items of Protective Clothing and Gear										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Insecticides—Continued											
Dicofol (7)	—	57	—	14	29	—	—	—	14	—	—
Dimethoate (2)	—	—	—	—	50	—	—	—	—	—	—
Endosulfan (26)	27	54	4	19	46	4	19	19	23	4	—
Ethion (4)	25	25	—	—	75	—	25	25	50	—	—
Fenbutatin-oxide (1)	—	100	—	—	100	—	—	—	—	—	—
Fenvalerate (14)	21	36	—	—	43	—	7	—	21	—	—
Fonofos (2)	—	—	—	—	50	—	—	—	—	—	—
Formetanate hydrochloride (1)	—	—	—	—	100	—	—	—	—	—	—
Malathion (5)	60	80	—	20	20	20	—	—	20	—	—
Mercaptodimethur (2)	—	50	—	50	50	—	—	—	—	—	—
Methamidophos (7)	43	71	14	43	43	14	57	—	43	—	—
Methomyl (12)	42	67	33	50	33	50	67	—	33	17	—
Methoxychlor (5)	20	40	—	60	40	—	40	20	20	—	—
Mevinphos (1)	100	100	—	—	100	—	—	—	—	—	—
Oil (22)	14	23	—	9	50	—	9	5	23	5	—
Oxamyl (4)	50	—	—	25	75	—	25	—	25	—	—
Oxydemeton-methyl (3)	33	—	—	—	—	—	—	—	—	—	—
Parathion (25)	60	52	4	20	60	24	32	12	24	—	—
Permethrin (5)	80	80	—	80	60	60	—	—	—	—	—
Phorate (1)	100	—	—	—	100	—	—	—	—	—	—
Phosalone (5)	40	20	—	60	60	—	—	—	60	20	—
Phosmet (51)	31	51	2	27	47	6	20	12	16	2	—
Propargite (3)	33	33	—	33	67	33	67	—	—	—	—
Streptomycin (8)	25	50	12	25	75	12	38	12	38	—	—
Totals (399)	35	45	4	25	50	10	21	8	21	3	0
Other Pesticides											
Chloropicrin (2)	—	50	—	—	50	—	—	—	—	—	—
Daminazide (1)	—	—	—	—	—	—	—	—	—	—	—
Ethephon (1)	—	100	—	—	—	—	—	—	—	—	—
M.H. (2)	—	—	—	—	50	—	—	—	—	—	—
Zinc phosphate (1)	—	—	—	—	—	—	—	100	—	—	—
Totals (7)	0	29	0	0	29	0	0	14	0	0	0

Table 29. Use of Protective Gear and Clothing by Applicators of Fungicides on Specific Crop Groupings

Fungicide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Maneb (1)	—	—	—	—	—	—	—	—	—	—	—
Crop Grouping: Bramble Fruit											
Benomyl (2)	—	50	—	50	100	50	50	—	50	—	—
Captan (3)	—	33	—	33	100	33	33	—	67	—	—
Sulfur (1)	—	100	—	100	100	—	—	—	—	—	—
Totals (6)	0	50	0	50	100	33	33	0	50	0	0
Crop Grouping: Strawberries/Blueberries											
Benomyl (11)	27	45	—	36	73	18	18	—	45	—	—
Captan (12)	17	33	—	25	58	8	17	—	42	—	—
Totals (23)	22	39	0	30	65	13	17	0	43	0	0
Crop Grouping: Vine and Pod Vegetables											
Benomyl (1)	—	—	—	—	100	—	—	—	—	—	—
Chlorothalonil (1)	—	100	—	—	100	—	—	—	—	—	—
Copper (2)	—	100	—	—	100	—	50	—	50	—	—
Mancozeb (1)	—	—	—	—	—	—	—	—	—	—	—
Maneb (1)	—	100	—	—	100	—	—	—	—	—	—
Totals (6)	0	67	0	0	83	0	17	0	43	0	0
Crop Grouping: Tree Fruit											
Benomyl (22)	23	23	—	27	68	14	14	9	36	5	—
Captafol (2)	100	50	—	50	100	—	100	50	—	50	—
Captan (33)	21	21	3	27	61	12	21	12	30	6	—
Copper sulfate (1)	—	—	—	—	—	—	—	—	—	—	—
Dikar (10)	30	30	10	30	40	20	30	20	10	10	10

Table 29. Use of Protective Gear and Clothing by Applicators of Fungicides on Specific Crop Groupings—Continued

Fungicide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Tree Fruit—Continued											
Dinocap (2)	50	50	50	50	50	50	50	50	50	—	—
Dodine (34)	26	38	6	26	56	18	26	6	38	—	—
Ferbam (4)	25	—	—	25	75	25	25	—	—	—	—
Folpet (2)	—	—	—	—	—	—	—	—	—	—	—
Glyodin (2)	100	—	100	—	100	—	—	—	—	—	—
Mancozeb (5)	—	40	—	—	80	—	—	—	60	—	—
Maneb (1)	—	—	—	—	8	—	—	—	—	—	—
Metiram (11)	18	27	—	27	55	9	27	—	9	—	—
Sulfur (6)	17	—	—	17	50	—	17	—	17	—	—
Thiophanate-methyl (1)	100	100	—	—	—	—	—	—	—	—	—
Triforine (1)	—	—	—	100	100	—	—	—	—	—	—
Zineb (7)	29	43	14	57	57	14	29	14	43	14	—
Totals (144)	24	27	5	27	58	13	22	9	27	4	1
Crop Grouping: Leafy Vegetables											
Captan (2)	50	50	50	50	100	100	100	50	100	—	—
Copper (2)	—	—	—	—	—	—	—	—	—	—	50
Mancozeb (1)	—	—	—	—	—	—	—	—	—	—	—
Maneb (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (6)	17	17	17	17	33	33	33	17	33	0	17
Crop Grouping: Root Vegetables											
Mancozeb (7)	14	14	—	14	57	—	14	14	—	—	—
Maneb (5)	20	40	—	20	60	—	—	—	20	—	—
Totals (12)	17	25	0	17	58	0	8	8	8	0	0
Crop Grouping: Gourd Vegetables											
Captafol (1)	—	—	—	—	—	—	—	—	—	—	100
Chlorothalonil (3)	—	—	—	—	100	—	—	—	33	—	—
Mancozeb (1)	—	—	—	—	100	—	—	—	—	—	—
Sulfur (1)	—	—	—	—	100	—	—	—	—	—	—
Totals (6)	0	0	0	0	83	0	0	0	17	0	17
Crop Grouping: Tomatoes and Peppers											
Benomyl (2)	100	100	—	—	50	—	—	—	—	—	—
Captafol (4)	—	75	—	—	75	—	25	25	25	—	25
Chlorothalonil (4)	25	25	—	—	—	—	—	—	—	—	25
Copper (8)	13	50	—	—	25	—	—	13	13	—	25
Mancozeb (7)	14	71	—	—	57	—	—	14	28	—	28
Maneb (1)	—	—	—	—	—	—	—	—	—	—	100
Totals (26)	19	58	0	0	38	0	4	12	15	0	27
Crop Grouping: Grapes											
Benomyl (3)	33	—	—	33	100	67	67	—	67	—	—
Bordeaux (1)	—	—	—	—	—	—	—	—	—	—	—
Captan (11)	27	—	—	18	45	18	27	9	36	—	—
Copper (3)	—	—	—	—	33	—	—	—	—	—	—
Dinocap (1)	100	—	—	100	—	—	—	—	100	—	—
Ferbam (10)	30	20	—	20	50	10	—	10	20	—	—
Folpet (6)	67	17	—	33	67	17	—	17	50	—	—
Mancozeb (2)	50	—	—	50	50	50	50	—	50	—	—
Maneb (1)	100	—	—	100	—	—	—	—	100	—	—
Triadimefon (1)	100	—	—	100	100	100	100	—	100	—	—
Totals (39)	38	8	0	28	51	21	18	8	38	0	0
Crop Grouping: Not Indicated											
Benomyl (1)	100	—	—	—	—	—	—	—	—	—	100
Captafol (1)	100	—	—	—	—	—	100	—	—	—	100
Captan (2)	50	50	—	50	50	—	—	—	50	—	50
Copper (1)	100	—	—	—	—	—	—	—	—	—	—
Thiram (1)	—	—	—	—	100	—	100	—	—	—	—
Totals (6)	67	17	0	17	33	0	33	0	17	0	50

Table 30. Use of Protective Gear and Clothing By Mixers-Loaders for the Use of Fungicides on Specific Crop Groupings

Fungicide (No. Reporting)	Percent of Mixers-Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Maneb (1)	—	—	—	—	—	—	—	—	—	—	—
Crop Grouping: Bramble Fruit											
Benomyl (2)	—	50	—	50	50	—	—	50	—	—	—
Captan (3)	—	33	—	33	67	—	—	33	—	—	—
Sulfur (1)	—	100	—	100	100	—	—	100	—	—	—
Totals (6)	0	50	0	50	67	0	0	50	0	0	0
Crop Grouping: Strawberries/Blueberries											
Benomyl (11)	18	64	—	36	64	9	9	9	27	—	—
Captan (12)	8	50	—	25	50	—	—	8	17	—	—
Totals (23)	13	57	0	30	57	4	4	9	22	0	0
Crop Grouping: Vine and Pod Vegetables											
Benomyl (1)	—	—	—	—	100	—	—	—	—	—	—
Chlorothalonil (1)	—	100	—	—	100	—	—	—	—	—	—
Copper (2)	50	100	—	—	50	—	—	—	50	—	—
Mancozeb (1)	—	—	—	—	—	—	—	—	—	—	—
Maneb (1)	—	100	—	—	100	—	—	—	—	—	—
Totals (6)	17	67	0	0	67	0	0	0	17	0	0
Crop Grouping: Tree Fruit											
Benomyl (22)	27	32	—	27	68	—	14	9	18	—	—
Captafol (2)	100	50	—	50	100	—	—	50	—	—	—
Captan (33)	24	33	3	24	58	6	15	15	15	—	—
Copper sulfate (1)	—	100	—	—	—	—	—	—	—	—	—
Dikar (10)	40	60	10	40	40	20	30	20	10	—	—
Dinocap (2)	50	50	50	50	50	50	50	50	50	—	—
Dodine (34)	21	44	6	26	50	6	9	9	15	—	—
Ferbam (4)	25	—	—	25	75	—	25	—	—	—	—
Folpet (2)	—	—	—	—	—	—	—	—	—	—	—
Glyodin (2)	50	—	—	—	—	—	—	—	—	—	—
Mancozeb (5)	—	40	—	—	60	—	—	—	20	—	—
Maneb (1)	—	—	—	—	100	—	—	—	—	—	—
Metiram (11)	18	18	—	27	45	—	18	9	9	—	—
Sulfur (6)	33	—	—	17	67	—	17	—	17	—	—
Thiophanate methyl (1)	100	100	—	—	—	—	—	—	—	—	—
Triforine (1)	—	—	—	100	100	—	—	—	—	—	—
Zineb (7)	43	43	14	43	57	14	43	14	43	—	—
Totals (144)	26	35	4	26	55	6	15	11	15	0	0
Crop Grouping: Leafy Vegetables											
Captan (2)	50	50	50	50	50	50	50	50	50	—	—
Copper (2)	—	—	—	—	—	—	—	—	—	—	—
Mancozeb (1)	—	—	—	—	—	—	—	—	—	—	—
Maneb (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (6)	17	17	17	17	17	17	17	17	17	0	0
Crop Grouping: Root Vegetables											
Mancozeb (7)	—	29	—	—	57	—	14	14	—	—	—
Maneb (5)	20	40	—	20	60	—	—	—	20	—	—
Totals (12)	8	33	0	8	58	0	8	8	8	0	0
Crop Grouping: Gourd Vegetables											
Captafol (1)	—	—	—	—	—	—	—	—	—	—	—
Chlorothalonil (3)	—	33	—	—	67	—	—	—	—	—	—
Mancozeb (1)	—	—	—	—	100	—	—	100	—	—	—
Sulfur (1)	—	100	—	—	100	—	—	—	—	—	—
Totals (6)	0	33	0	0	67	0	0	17	0	0	0
Crop Grouping: Tomatoes and Peppers											
Benomyl (2)	50	100	—	—	50	—	—	—	—	—	—
Captafol (4)	25	50	—	—	25	—	—	—	—	—	—
Chlorothalonil (4)	25	50	—	—	—	—	—	—	—	—	—
Copper (8)	13	50	—	—	13	—	—	—	13	—	—
Mancozeb (7)	14	71	—	—	43	—	—	—	14	—	—
Maneb (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (26)	19	58	0	0	23	0	0	0	8	0	0

Table 30. Use of Protective Gear and Clothing By Mixers-Loaders for the Use of Fungicides on Specific Crop Groupings—Continued

Fungicide (No. Reporting)	Percent of Mixer-Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respi-rator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Grapes											
Benomyl (3)	33	—	—	—	33	33	—	—	—	—	—
Bordeaux (1)	—	—	—	—	—	—	—	—	—	—	—
Captan (11)	27	18	—	18	27	9	9	9	36	—	—
Copper (3)	—	—	—	—	67	—	—	—	33	—	—
Dinocap (1)	100	—	—	100	—	—	—	—	100	—	—
Ferbam (10)	20	40	—	30	60	—	—	10	20	—	—
Folpet (6)	50	50	—	50	67	—	—	17	33	—	—
Mancozeb (2)	50	—	—	—	—	50	—	—	—	—	—
Maneb (1)	100	—	—	100	—	—	—	—	100	—	—
Triadimefon (1)	100	—	—	—	—	100	—	—	—	—	—
Totals (39)	33	23	0	27	41	10	3	8	28	0	0
Crop Grouping: Not Indicated											
Benomyl (1)	100	—	—	—	—	—	—	—	—	—	—
Captafol (1)	100	—	—	—	—	—	100	—	—	—	—
Captan (2)	50	50	—	50	50	—	50	—	50	—	—
Copper (1)	100	—	—	—	—	—	—	—	—	—	—
Thiram (1)	—	—	—	—	100	—	100	—	—	—	—
Totals (6)	67	17	0	17	33	0	50	0	17	0	0

Table 31. Use of Protective Gear and Clothing by Applicators for the Use of Herbicides on Specific Crop Groupings

Herbicide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respi-rator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Alachlor (2)	50	50	—	—	100	—	—	—	—	—	—
Atrazine (5)	—	20	—	—	40	—	—	—	—	—	—
Butylate (2)	50	—	—	—	50	—	—	—	—	—	—
Cyanazine (7)	14	14	—	—	71	—	—	—	14	—	—
Metolachlor (1)	—	—	—	—	100	—	—	—	—	—	—
Totals (17)	18	18	0	0	65	0	0	0	6	0	0
Crop Grouping: Bramble Fruit											
2,4-D (1)	—	—	—	—	100	—	—	—	—	—	—
DCPA (2)	—	—	—	—	100	—	—	—	—	—	—
Diphenamid (1)	—	—	—	—	100	—	—	—	—	—	—
Glyphosate (2)	—	—	—	—	100	—	—	—	100	—	—
Napropamide (1)	—	—	—	—	100	—	—	—	100	—	—
Oryzalin (1)	—	—	—	—	100	—	—	—	—	—	—
Simazine (1)	—	—	—	—	100	—	—	—	100	—	—
Terbacil (1)	—	—	—	—	100	—	—	—	100	—	—
Totals (10)	0	0	0	0	100	0	0	0	50	0	0
Crop Grouping: Strawberries/Blueberries											
2,4-D (1)	—	100	—	—	—	—	—	—	100	—	—
Chloroxuron (2)	—	50	—	—	—	—	—	—	50	—	—
Diphenamid (2)	—	50	—	50	100	—	—	—	100	—	—
Diuron (2)	—	—	—	—	100	—	—	—	—	—	—
Napropamide (16)	12	6	—	6	25	—	6	—	6	—	—
Simazine (1)	—	—	—	—	100	—	—	—	—	—	—
Terbacil (5)	40	—	—	20	80	—	20	—	—	—	—
Totals (29)	14	14	0	11	46	0	7	0	18	0	0
Crop Grouping: Vine and Pod Vegetables											
Alachlor (2)	50	50	—	—	50	—	—	—	—	—	—
Bensulide (1)	—	—	—	—	100	—	—	—	—	—	—
Bentazon (1)	100	100	—	—	—	—	—	—	—	—	—
Chloramben (2)	100	50	—	—	50	—	—	—	—	—	—
Metribuzin (1)	—	—	—	—	—	—	—	—	—	—	—
Naptalam (1)	—	—	—	—	100	—	—	—	—	—	—
Totals (8)	50	38	0	0	50	0	0	0	0	0	0

Table 31. Use of Protective Gear and Clothing by Applicators for the Use of Herbicides on Specific Crop Groupings—Continued

Herbicide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Tree Fruit											
Glyphosate (2)	—	—	—	—	50	—	—	—	—	—	—
Napropamide (1)	—	—	—	—	—	—	—	—	100	—	—
Paraquat (8)	63	50	—	38	38	—	25	—	25	—	—
Simazine (2)	—	—	—	—	50	—	—	—	—	—	—
Totals (13)	38	31	0	23	38	0	15	0	23	0	0
Crop Grouping: Leafy Vegetables											
Alachlor (1)	100	100	—	—	100	—	—	—	—	—	—
Simazine (1)	—	—	—	—	100	—	—	—	—	—	—
Trifluralin (2)	50	50	—	—	50	—	—	—	—	—	—
Totals (4)	50	50	0	0	75	0	0	0	0	0	0
Crop Grouping: Root Vegetables											
Alachlor (2)	—	—	—	—	50	—	—	—	50	—	—
Chlorpropham (1)	—	—	—	—	—	—	—	—	—	—	—
Dinoseb (1)	—	100	—	100	—	—	—	—	—	—	—
Diquat (1)	—	—	—	—	100	—	—	—	—	—	—
EPTC (3)	—	—	—	—	67	—	—	33	—	—	—
Gylphosate (2)	—	50	—	—	50	—	—	—	—	—	—
Linuron (3)	—	—	—	—	100	—	—	—	33	—	—
Metolachlor (2)	—	—	—	—	50	—	—	—	—	—	—
Metribuzin (5)	20	40	—	40	60	—	—	—	—	—	—
Sethoxydim (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (21)	5	19	0	14	57	0	0	5	10	0	0
Crop Grouping: Gourd Vegetables											
Chloramben (2)	50	0	0	0	50	0	0	0	0	0	0
Crop Grouping: Tomatoes and Peppers											
Chloramben (2)	50	100	—	—	—	—	—	50	50	—	—
Metribuzin (5)	40	60	—	—	40	—	—	20	—	—	20
Pebulate (2)	50	100	—	—	—	—	—	50	—	—	50
Trifluralin (3)	33	67	—	—	—	—	—	33	—	—	33
Totals (12)	42	75	0	0	17	0	0	33	8	0	25
Crop Grouping: Grapes											
Dinoseb (1)	100	—	—	100	100	100	100	—	100	—	—
Diuron (3)	33	—	—	—	33	—	—	33	33	—	—
Glyphosate (3)	33	—	—	33	33	33	33	—	33	—	—
Paraquat (3)	67	—	—	33	67	33	—	33	33	—	—
Simazine (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (11)	45	0	0	27	45	27	18	18	36	0	0
Crop Grouping: Not Indicated											
CDAA (1)	—	—	—	—	—	—	—	—	—	—	—
Oryzalin (1)	100	—	—	—	—	—	—	—	—	—	100
Paraquat (2)	—	100	—	50	50	—	—	—	50	—	50
Simazine (2)	50	50	—	50	50	—	—	—	50	—	—
Totals (6)	33	50	0	33	33	0	0	0	33	0	33

Table 32. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Herbicides on Specific Crop Groupings

Herbicide (No. Reporting)	Percent of Mixers/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Alachlor (2)	—	50	—	—	50	—	—	—	—	—	—
Atrazine (5)	—	20	—	—	40	—	—	—	—	—	—
Butylate (2)	50	50	—	—	50	—	—	—	—	—	—
Cyanazine (7)	14	29	—	—	57	—	—	—	14	—	—
Metolachlor (1)	—	—	—	—	100	—	—	—	—	—	—
Totals (17)	12	29	0	0	53	0	0	0	6	0	0

Table 32. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Herbicides on Specific Crop Groupings—Continued

Herbicide (No. Reporting)	Percent of Mixers/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Bramble Fruit											
2,4-D (1)	—	—	—	—	100	—	—	—	—	—	—
DCPA (2)	—	—	—	—	100	—	—	—	—	—	—
Diphenamid (1)	—	—	—	—	100	—	—	—	—	—	—
Glyphosate (2)	—	—	—	—	100	—	—	—	—	—	—
Napropamide (1)	—	—	—	—	100	—	—	—	—	—	—
Oryzalin (1)	—	—	—	—	—	—	—	—	—	—	—
Simazine (1)	—	—	—	—	100	—	—	—	—	—	—
Terbacil (1)	—	—	—	—	100	—	—	—	—	—	—
Totals (10)	0	0	0	0	90	0	0	0	0	0	0
Crop Grouping: Strawberries/Blueberries											
2,4-D (1)	—	100	—	—	100	—	—	—	100	—	—
Chloroxuron (2)	—	100	—	—	50	—	—	—	50	—	—
Diphenamid (2)	—	100	—	50	100	—	50	—	50	—	—
Diuron (2)	—	—	—	—	50	—	—	—	—	—	—
Napropamide (16)	33	33	—	17	67	—	—	—	17	—	—
Simazine (1)	—	—	—	—	—	—	—	—	—	—	—
Terbacil (5)	40	20	—	20	60	—	—	—	—	—	—
Totals (29)	14	29	0	11	43	0	4	0	14	0	0
Crop Grouping: Vine and Pod Vegetables											
Alachlor (2)	—	—	—	—	—	—	—	—	—	—	—
Bensulide (1)	—	—	—	—	—	—	—	—	—	—	—
Bentazon (1)	100	100	—	—	—	—	—	—	—	—	—
Chloramben (2)	100	100	—	—	50	—	—	—	—	—	—
Metribuzin (1)	—	—	—	—	—	—	—	—	—	—	—
Naptalam (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (8)	38	38	0	0	12	0	0	0	0	0	0
Crop Grouping: Tree Fruit											
Glyphosate (2)	—	50	—	—	50	—	—	—	—	—	—
Napropamide (1)	100	—	—	—	100	—	100	—	100	—	—
Paraquat (8)	75	63	—	38	50	—	12	—	25	—	—
Simazine (2)	—	50	—	—	50	—	—	—	—	—	—
Totals (13)	54	54	0	23	54	0	15	0	23	0	0
Crop Grouping: Leafy Vegetables											
Alachlor (1)	—	—	—	—	—	—	—	—	—	—	—
Simazine (1)	—	—	—	—	—	—	—	—	—	—	—
Trifluralin (2)	50	50	—	—	50	—	—	—	—	—	—
Totals (4)	25	25	0	0	25	0	0	0	0	0	0
Crop Grouping: Root Vegetables											
Alachlor (2)	—	—	—	—	50	—	—	—	50	—	—
Chlorpropham (1)	—	—	—	—	—	—	—	—	—	—	—
Dinoseb (1)	—	100	—	—	—	—	—	—	—	—	—
Diquat (1)	—	—	—	—	100	—	—	—	—	—	—
EPTC (3)	—	—	—	—	67	—	—	33	—	—	—
Glyphosate (2)	—	50	—	—	—	—	—	—	—	—	—
Linuron (3)	—	—	—	—	100	—	—	—	33	—	—
Metolachlor (2)	—	—	—	—	—	—	—	—	—	—	—
Metribuzin (5)	20	60	—	—	40	—	—	—	—	—	—
Sethoxydim (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (21)	5	24	0	0	43	0	0	5	10	0	0
Crop Grouping: Gourd Vegetables											
Chloramben (2)	50	50	0	0	50	0	0	0	0	0	0
Crop Grouping: Tomatoes and Peppers											
Chloramben (2)	50	100	—	—	—	—	—	—	—	—	—
Metribuzin (5)	40	80	—	—	20	—	—	—	—	—	—
Pebulate (2)	50	100	—	—	—	—	—	—	—	—	—
Trifluralin (3)	33	100	—	—	—	—	—	—	—	—	—
Totals (12)	42	92	0	0	8	0	0	0	0	0	0
Crop Grouping: Grapes											
Dinoseb (1)	100	—	—	—	—	100	—	—	—	—	—
Diuron (3)	33	33	—	—	33	—	—	33	67	—	—
Glyphosate (3)	33	—	—	—	—	33	—	—	33	—	—
Paraquat (3)	67	33	—	33	67	—	—	33	33	—	—
Simazine (1)	—	—	—	—	—	—	—	—	—	—	—
Totals (11)	45	18	0	9	27	18	0	18	36	0	0

Table 32. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Herbicides on Specific Crop Groupings—Continued

Herbicide (No. Reporting)	Percent of Mixers/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Not Indicated											
CDAA (1)	—	—	—	—	—	—	—	—	—	—	—
Oryzalin (1)	100	—	—	—	—	—	—	—	—	—	—
Paraquat (2)	—	100	—	50	50	—	50	—	50	—	—
Simazine (2)	50	50	—	50	50	—	50	—	50	—	—
Totals (6)	33	50	0	33	33	0	33	0	33	0	0

Table 33. Use of Protective Gear and Clothing by Applicators for the Use of Insecticides, Miticides, Nematicides and Acaricides on Specific Crop Groupings

Insecticide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Carbaryl (18)	22	44	11	11	61	17	33	6	28	—	—
Carbofuran (1)	—	—	—	—	100	—	—	—	—	—	—
Diazinon (2)	—	50	—	—	50	—	50	—	—	—	—
Fenvalerate (4)	—	25	—	—	75	—	—	—	25	—	25
Fonofos (1)	—	—	—	—	100	—	—	—	—	—	—
Malathion (1)	—	100	—	—	100	—	100	—	—	—	—
Methomyl (4)	25	50	—	50	75	75	25	—	50	25	50
Oxydemeton-methyl (3)	33	33	—	—	33	—	—	—	—	—	—
Parathion (6)	50	33	—	17	100	33	17	—	17	17	17
Permethrin (1)	100	100	—	100	100	100	—	—	100	—	—
Totals (41)	24	41	5	15	71	22	24	2	24	5	10
Crop Grouping: Strawberries/Blueberries											
Azinphosmethyl (4)	25	75	—	75	50	25	25	—	25	25	—
Carbaryl (3)	—	33	—	33	67	33	33	—	67	—	—
Dicofol (1)	100	100	—	—	100	—	—	—	100	—	—
Endosulfan (5)	20	80	—	40	60	20	40	—	80	—	—
Malathion (2)	100	100	—	50	100	50	—	—	100	—	—
Totals (15)	33	73	0	47	67	27	27	0	67	7	0
Crop Grouping: Vine and Pod Vegetables											
Carbaryl (9)	22	67	—	11	67	22	11	11	44	—	—
Endosulfan (2)	—	50	—	—	100	—	50	—	—	—	—
Malathion (2)	50	100	—	—	100	50	100	—	50	—	—
Methoxychlor (1)	—	—	—	—	100	—	100	—	—	—	—
Totals (14)	21	64	0	7	79	21	36	7	36	0	0
Crop Grouping: Tree Fruit											
Amitraz (1)	100	100	—	100	—	—	—	—	100	—	—
Azinphosmethyl (31)	55	48	6	39	74	23	39	10	48	10	6
Carbaryl (18)	61	67	6	33	67	33	33	11	44	—	—
Chlorpyrifos (1)	—	—	—	—	—	—	—	—	—	—	—
Cyhexatin (12)	42	42	—	33	33	17	33	—	42	—	8
Demeton (2)	100	100	—	100	50	100	100	—	50	—	—
Diazinon (3)	33	33	—	33	100	33	33	—	67	—	—
Dichlone (3)	—	—	—	—	67	—	33	—	33	—	—
Dicofol (5)	—	60	—	20	60	20	20	—	40	—	—
Dimethoate (1)	—	—	—	—	—	—	—	—	—	—	—
Dormant oil (21)	24	19	—	24	67	14	19	5	29	5	5
Endosulfan (11)	55	64	9	36	64	27	45	18	36	—	9
Ethion (4)	50	50	—	—	75	25	25	50	50	—	—
Fenbutatin-oxide (1)	100	100	—	—	100	—	100	—	—	—	—
Fenvalerate (3)	67	67	—	—	33	—	—	—	33	—	33
Formetanate hydrochloride (1)	—	—	—	—	100	—	—	—	—	—	—
Mercaptodimethur (2)	—	—	—	—	50	—	—	—	—	—	—
Oxamyl (2)	—	—	—	50	50	—	—	—	50	—	—
Parathion (5)	60	40	20	20	80	60	60	40	40	—	—
Permethrin (1)	100	100	—	100	—	100	100	—	100	—	—
Phosalone (4)	50	50	—	50	100	25	—	50	50	—	25

Table 33. Use of Protective Gear and Clothing by Applicators for the Use of Insecticides, Miticides, Nematicides and Acaricides on Spceific Crop Groupings—Continued

Insecticide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respi-rator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Tree Fruit—Continued											
Phosmet (46)	43	57	2	30	63	28	39	13	43	2	4
Propargite (3)	—	—	—	33	67	33	67	—	33	—	—
Streptomycin (8)	25	38	13	25	63	13	25	13	38	—	—
Totals (189)	43	47	4	31	64	24	34	11	41	3	5
Crop Grouping: Leafy Vegetables											
Azinphosmethyl (3)	67	67	—	33	33	33	67	—	33	—	—
B.T. (4)	25	50	—	25	50	25	25	—	25	—	25
Carbaryl (3)	33	33	33	33	67	67	67	33	67	—	—
Diazinon (1)	—	—	—	—	100	—	—	—	—	—	—
Fenvalerate (2)	—	50	—	—	50	—	—	—	—	—	50
Methamidophos (2)	—	100	—	100	—	50	100	—	50	—	—
Methomyl (3)	—	67	—	67	—	67	67	—	67	—	—
Parathion (2)	50	50	—	—	100	—	—	—	—	—	50
Permethrin (1)	100	—	—	100	100	100	—	—	100	—	—
Totals (21)	29	53	5	38	48	38	43	5	38	0	14
Crop Grouping: Root Vegetables											
Aldicarb (6)	17	33	—	17	67	—	—	—	—	—	—
Azinphosmethyl (3)	67	67	33	67	—	33	67	—	33	—	—
Carbaryl (5)	60	40	—	40	60	—	—	—	20	—	—
Carbofuran (6)	33	33	—	33	67	17	33	—	17	—	—
Diazinon (1)	100	—	—	—	100	—	—	—	—	—	—
Dimethoate (1)	—	—	—	—	100	—	—	—	—	—	—
Fenvalerate (2)	—	—	—	—	100	—	—	—	50	—	50
Fonofos (1)	—	—	—	—	—	—	—	—	—	—	—
Methamidophos (3)	33	67	—	33	33	33	67	—	67	—	33
Oxamyl (2)	50	—	—	—	50	—	—	—	—	—	—
Parathion (2)	50	50	—	—	50	—	—	—	—	—	—
Permethrin (2)	50	50	—	50	50	50	—	—	50	—	—
Phorate (1)	100	—	—	—	100	—	—	—	—	—	—
Totals (35)	40	34	3	26	57	11	17	0	20	0	6
Crop Grouping: Gourd Vegetables											
Azinphosmethyl (2)	50	50	—	50	50	50	50	—	50	—	—
Carbaryl (1)	100	—	—	100	100	100	—	—	—	—	—
Diazinon (1)	—	—	—	—	—	—	—	—	—	—	100
Endosulfan (2)	50	50	—	—	100	—	—	—	—	—	50
Parathion (1)	100	—	—	—	100	100	—	100	100	—	—
Totals (7)	57	29	0	29	71	43	14	14	29	0	29
Crop Grouping: Tomatoes and Peppers											
Acephate (2)	—	—	—	—	50	—	—	—	—	—	50
Azinphosmethyl (3)	67	33	—	33	67	33	33	—	33	—	—
B.T. (2)	50	—	—	—	100	—	—	—	50	—	—
Carbaryl (10)	20	40	—	—	40	—	—	20	20	—	30
Endosulfan (5)	20	100	—	—	80	—	20	20	40	—	40
Fenvalerate (1)	100	100	—	—	—	—	—	—	—	—	—
Methamidophos (2)	50	50	—	—	100	—	—	—	50	—	—
Methomyl (3)	67	67	—	67	67	67	67	—	67	33	—
Totals (28)	36	50	0	11	61	11	14	11	32	4	21
Crop Grouping: Grapes											
Azinphosmethyl (4)	25	—	—	25	50	25	—	25	50	—	—
Carbaryl (14)	43	14	—	29	71	29	29	7	43	7	7
Dicofol (1)	—	—	—	—	—	—	—	—	—	—	—
Methoxychlor (4)	50	25	—	50	25	25	25	—	25	—	—
Parathion (8)	50	13	—	25	63	25	38	13	63	—	13
Phosalone (1)	100	—	—	100	—	—	100	—	100	—	—
Phosmet (3)	33	33	—	67	67	67	33	—	33	—	—
Totals (35)	43	14	0	34	57	29	29	9	46	3	6
Crop Grouping: Not Indicated											
Carbaryl (2)	50	—	—	—	—	—	50	—	—	—	50
Endosulfan (1)	—	—	—	—	100	—	—	—	—	—	—
Fenvalerate (2)	—	50	—	—	—	—	50	—	—	—	50
Methomyl (1)	100	—	—	—	—	—	100	—	—	—	100
Parathion (1)	—	—	—	—	—	—	100	—	—	—	100
Phosmet (1)	100	—	—	—	—	—	100	—	—	—	100
Totals (8)	38	13	0	0	13	0	63	0	0	0	63

Table 34. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Insecticides, Miticides, Nematicides and Acaricides on Specific Crop Groupings

Insecticide (No. Reporting)	Percent of Mixers/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Sweet Corn											
Carbaryl (18)	22	39	11	11	33	6	6	6	6	—	—
Carbofuran (1)	—	—	—	—	—	—	—	—	—	—	—
Diazinon (2)	50	50	—	—	—	—	—	—	—	—	—
Fenvalerate (4)	—	25	—	—	75	—	—	—	25	—	—
Fonofos (1)	—	—	—	—	100	—	—	—	—	—	—
Malathion (1)	100	100	—	—	—	—	—	—	—	—	—
Methomyl (4)	50	75	25	50	25	50	50	—	25	25	—
Oxydemeton-methyl (3)	33	—	—	—	—	—	—	—	—	—	—
Parathion (6)	67	50	—	17	67	17	33	—	—	—	—
Permethrin (1)	100	100	—	100	100	100	—	—	—	—	—
Totals (41)	34	41	7	15	39	12	12	2	7	2	0
Crop Grouping: Strawberries/Blueberries											
Azinphosmethyl (4)	25	75	—	75	75	25	25	25	—	25	—
Carbaryl (3)	—	33	—	33	33	33	33	—	33	—	—
Dicofol (1)	—	100	—	—	—	—	—	—	—	—	—
Endosulfan (5)	—	100	—	40	60	20	40	20	40	—	—
Malathion (2)	50	100	—	50	50	50	—	—	50	—	—
Totals (15)	13	80	0	47	53	27	27	13	27	7	0
Crop Grouping: Vine and Pod Vegetables											
Carbaryl (9)	22	67	—	11	56	11	—	—	22	—	—
Endosulfan (2)	—	50	—	—	100	—	50	50	—	—	—
Malathion (2)	50	50	—	—	—	—	—	—	—	—	—
Methoxychlor (1)	—	—	—	—	100	—	100	100	—	—	—
Totals (14)	21	57	0	7	57	7	14	14	14	0	0
Crop Grouping: Tree Fruit											
Amitraz (1)	100	100	—	100	—	—	—	—	100	100	—
Azinphosmethyl (31)	52	52	—	35	65	6	29	13	23	10	—
Carbaryl (18)	39	56	6	22	56	11	17	11	22	—	—
Chlorpyrifos (1)	—	—	—	—	—	—	—	—	—	—	—
Cyhexatin (12)	42	42	—	25	33	—	17	17	17	8	—
Demeton (2)	100	100	—	100	50	50	50	—	50	—	—
Diazinon (3)	33	33	—	33	100	—	33	—	—	—	—
Dichlone (3)	33	—	—	—	100	—	67	—	33	—	—
Dicofol (5)	—	60	—	20	40	—	—	—	20	—	—
Dimethoate (1)	—	—	—	—	—	—	—	—	—	—	—
Dormant oil (21)	19	29	—	14	67	5	10	5	10	—	—
Endosulfan (11)	55	36	9	27	45	—	18	27	27	9	—
Ethion (4)	25	25	—	—	75	—	25	25	50	—	—
Fenbutatin-oxide (1)	—	100	—	—	100	—	—	—	—	—	—
Fenvalerate (3)	67	67	—	—	33	—	—	—	33	—	—
Formetanate hydrochloride (1)	—	—	—	—	100	—	—	—	—	—	—
Mercaptodimethur (2)	—	50	—	50	50	—	—	—	—	—	—
Oxamyl (2)	50	—	—	50	100	—	50	—	50	—	—
Parathion (5)	40	60	20	20	60	40	40	40	20	—	—
Permethrin (1)	100	100	—	100	—	—	—	—	—	—	—
Phosalone (4)	25	25	—	50	75	—	—	—	50	25	—
Phosmet (46)	30	52	2	26	48	7	20	13	17	2	—
Propargite (3)	33	33	—	33	67	33	67	—	—	—	—
Streptomycin (8)	25	50	12	25	75	12	38	12	38	—	—
Totals (189)	36	46	3	26	57	7	21	12	21	4	0
Crop Grouping: Leafy Vegetables											
Azinphosmethyl (3)	33	33	33	33	—	33	67	—	33	—	—
B.T. (4)	25	50	25	25	50	25	25	—	25	—	—
Carbaryl (3)	33	33	33	33	33	33	33	33	33	—	—
Diazinon (1)	—	—	—	—	100	—	—	—	—	—	—
Fenvalerate (2)	—	—	—	—	—	—	—	—	—	—	—
Methamidophos (2)	—	100	50	100	—	50	100	—	50	—	—
Methomyl (3)	—	67	67	67	—	67	67	—	67	—	—
Parathion (2)	50	50	—	—	50	—	—	—	—	—	—
Permethrin (1)	100	100	—	100	100	100	—	—	—	—	—
Totals (21)	24	48	29	38	29	33	38	5	29	0	0

Table 34. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Insecticides, Miticides, Nematicides and Acaricides on Specific Crop Groupings—Continued

Insecticide (No. Reporting)	Percent of Mixer/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Root Vegetables											
Aldicarb (6)	17	33	—	17	67	—	—	—	—	—	—
Azinphosmethyl (3)	67	67	33	33	—	—	67	—	33	—	—
Carbaryl (5)	60	20	—	20	60	—	—	—	20	—	—
Carbofuran (6)	17	33	—	17	50	17	33	—	—	—	—
Diazinon (1)	100	—	—	—	100	—	—	—	—	—	—
Dimethoate (1)	—	—	—	—	100	—	—	—	—	—	—
Fenvalerate (2)	—	—	—	—	50	—	—	—	50	—	—
Fonofos (1)	—	—	—	—	—	—	—	—	—	—	—
Methamidophos (3)	33	67	—	33	33	—	67	—	67	—	—
Oxamyl (2)	50	—	—	—	50	—	—	—	—	—	—
Parathion (2)	50	50	—	—	50	—	—	—	—	—	—
Permethrin (2)	50	50	—	50	50	50	—	—	—	—	—
Phorate (1)	100	—	—	—	100	—	—	—	—	—	—
Totals (35)	37	31	3	17	51	6	17	0	14	0	0
Crop Grouping: Gourd Vegetables											
Azinphosmethyl (2)	50	50	50	50	50	50	50	—	50	—	—
Carbaryl (1)	100	100	—	100	100	100	—	—	—	—	—
Diazinon (1)	—	—	—	—	—	—	—	—	—	—	—
Endosulfan (2)	—	—	—	—	—	—	—	—	—	—	—
Parathion (1)	—	100	—	—	100	—	—	—	—	—	—
Totals (7)	29	43	14	29	43	29	14	0	14	0	0
Crop Grouping: Tomatoes and Peppers											
Acephate (2)	—	—	—	—	—	—	—	—	—	—	—
Azinphosmethyl (3)	67	33	33	33	67	33	33	—	33	—	—
B T. (2)	50	—	—	—	100	—	—	—	—	—	—
Carbaryl (10)	20	40	—	—	30	—	—	10	—	—	—
Endosulfan (5)	20	80	—	—	40	—	—	—	20	—	—
Fenvalerate (1)	100	100	—	—	—	—	—	—	—	—	—
Methamidophos (2)	100	50	—	—	100	—	—	—	—	—	—
Methomyl (3)	67	67	33	67	67	67	67	—	33	33	—
Totals (28)	39	46	7	11	46	11	11	4	11	4	0
Crop Grouping: Grapes											
Azinphosmethyl (4)	50	75	—	25	50	25	—	25	75	—	—
Carbaryl (14)	36	29	—	29	64	7	21	7	29	7	—
Dicofol (1)	—	—	—	—	—	—	—	—	100	—	—
Methoxychlor (4)	25	50	—	75	25	—	25	—	25	—	—
Parathion (8)	75	50	—	38	63	38	38	13	63	—	—
Phosalone (1)	100	—	—	100	—	—	—	—	100	—	—
Phosmet (3)	33	33	—	67	67	—	—	—	—	—	—
Totals (35)	45	40	0	40	54	14	20	9	43	3	0
Crop Grouping: Not Indicated											
Carbaryl (2)	50	—	—	—	50	—	50	—	—	—	—
Endosulfan (1)	—	—	—	—	—	—	—	—	—	—	—
Fenvalerate (2)	—	50	—	—	50	—	50	—	—	—	—
Methomyl (1)	100	—	—	—	—	—	100	—	—	—	—
Parathion (1)	—	—	—	—	—	—	100	—	—	—	—
Phosmet (1)	100	—	—	—	—	—	100	—	—	—	—
Totals (8)	38	13	0	0	25	0	63	0	0	0	0

Table 35. Use of Protective Gear and Clothing by Applicators for the Use of Other Pesticides[1] on Specific Crop Groupings

Pesticide (No. Reporting)	Percent of Applicators Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Brambles and Berries											
Chloropicrin (2)	—	50	—	—	100	—	—	—	50	—	—
Methyl bromide (4)	17	25	—	—	75	—	—	—	50	—	—
Totals (6)	17	33	0	0	83	0	0	0	50	0	0
Crop Grouping: Tree Fruit											
Alar (1)	—	—	—	—	—	—	—	—	—	—	—
Zinc phosphate (1)	100	100	—	—	100	—	100	—	—	—	—
Totals (2)	50	50	0	0	50	0	50	0	0	0	0
Crop Grouping: Root Vegetables											
MH (1)	0	0	0	0	0	0	0	0	0	0	0
Crop Grouping: Gourd Vegetables											
MH (1)	0	0	0	0	100	0	0	0	100	0	0

[1] Fumigants, growth regulators, rodenticides, etc

Table 36. Use of Protective Gear and Clothing by Mixers/Loaders for the Use of Other Pesticides[1] on Specific Crop Groupings

Pesticide (No. Reporting)	Percent of Mixers/Loaders Using Items of Protective Gear and Clothing										
	Goggles	Gloves	Apron	Boots	Cotton Shirt Trousers	Spray Suit	Respirator	Dust Mask	Head Cover	Self Cont. Breathing	Enclosed Cab
Crop Grouping: Brambles and Berries											
Chloropicrin (2)	—	50	—	—	50	—	—	—	—	—	—
Methyl bromide (4)	—	25	—	—	50	—	—	—	—	—	—
Totals (6)	0	33	0	0	50	0	0	0	0	0	0
Crop Grouping: Tree Fruit											
Alar (1)	—	—	—	—	—	—	—	—	—	—	—
Zinc phosphate (1)	—	—	—	—	—	—	—	100	—	—	—
Totals (2)	0	0	0	0	0	0	0	50	0	0	0
Crop Grouping: Root Vegetables											
MH (1)	0	0	0	0	0	0	0	0	0	0	0
Crop Grouping: Gourd Vegetables											
MH (1)	0	0	0	0	100	0	0	0	0	0	0

[1] Fumigants, growth regulators, rodenticides, etc

APPENDIX 1

1983 Ohio Pesticide Use Survey for Fruits and Vegetables

Dear Reporter:

The use of pesticides is of major importance in modern agriculture, and it is essential that those necessary for most effective crop production continue to be available when and where needed. This can be done by providing current information in defense of their use. This survey will help provide such information by indicating which pesticides are used, on what crops and in what quantities, and procedures associated with pesticide use.

Similar surveys were conducted in 1978 and 1979 and were highly successful. The 1983 survey will identify any major changes as the earlier ones and will substantiate the continued need of certain pesticides. Your cooperation by answering the following questions is important in measuring the importance of pesticides to agriculture in Ohio. Your reply is kept confidential and used only to obtain area, regional or state totals. Please refer to the glossary of pesticides for assistance in completing the survey.

Report for the Farm You Operate (Owned and Rented Acreage)

1983 Crop	Total Acres Planted or in Crop (or Square Footage for Greenhouse)	How Many Acres Were Treated for			
		Weed Control (Herbicides)	Insect/ Nematode Control (Insecticides)	Disease Control (Fungicides)	Other Control: Rodents, Deer Defoliant, Dessicant, etc.

Type of Operation

1983 Crop	Fresh Market		Contracted Processing (Acres)
	Field Grown (Acres)	Greenhouse (Acres or Sq. Ft.)	

Pesticides Used on Each Crop

Crop Treated	Pesticide Used [Bracket Tank Mixes]	Concentration or Formulation	Quantity of Undiluted Pesticide Formulation Used Per Acre for Each Application OR Total volume or Quantity Applied per Application (Specify lb., pt., qt., gal., oz., etc.)										Acres Treated per Application	Number of Applications	Applicator		Method of Application												Pest Target (Identify Major Reasons for Pesticide Use for Each Chemical and/or Tank Mix)
																	Aerial				Method								
			Wettable Powder	Granular	Liquid			Dust	Aerosol	Bait	Other (Specify)				Self	Commercial	Airplane	Helicopter	Ground Equipment	Dilute Spray	LV Spray	Fog	Irrigation	Soil Fumigation	Broadcast	Band	Spot	Other (Specify)	
List	List	%	lb	lb	pt	qt	gal	lb	oz	lb					✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Example																													
Sweet Corn	Carbaryl (Sevin)	50W	4									100 lb.	25	4	✓				✓	✓				✓				Corn Earworm
Apple	[Dodine	65WP	2.3*									[115 lb.*	[	[														Scab
	Mancozeb	80WP	5*									250 lb.*	50	7	✓				✓	✓				✓				Blotch
	Imidan]	50WP	8*									400 lb.*]	]	]														Codling Moth
	Demeton	6E			1*							6¼ gal.*	50	1	✓				✓	✓				✓				Apple Aphid
* Based on quantity of formulation used in 100 gal. of water and 400 gal. applied per acre																													

Was any of the following protective clothing or equipment used when handling or applying pesticides in 1983?

Face shield or goggles — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Rubber or neoprene gloves — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Rubber or plastic apron — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Rubber or neoprene boots — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Long-sleeved cotton shirt, cotton trousers — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Water resistant spray suit — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Gas mask or respirator — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Dust mask — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Washable head covering — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Self-contained breathing apparatus — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Enclosed delivery system and/or tractor cab — Yes _____ No _____
If yes, list pesticides with which used — (Handling) _____ (Applying) _____

Is the person(s) responsible for pesticide application in your operation a certified pesticide applicator? Yes _____ No _____

Are your greenhouses equipped with facilities for steam sterilization of soil? Yes _____ No _____

Pesticide storage: Which of the following conditions describe your facilities and procedures for pesticide storage? (circle all appropriate numbers)

1. Stored in a separate building
2. Stored in a building housing other materials
3. Separated by a barrier from other materials in the building
4. Kept under locked storage
5. Storage area is fireproof
6. Storage area has facilities for fire protection
7. Storage area has facilities for temperature control
8. Storage area has facilities for air movement
9. Storage area has provisions for separation and segregation of different pesticide materials
10. Storage area is equipped with isolation drainage system
11. Storage area is accessible only to authorized personnel
12. Pesticides are sometimes stored in other than the original container

Comments _____

Disposal of surplus pesticides: What procedures are used in disposal of surplus pesticides? (circle all appropriate numbers)

1. Surplus pesticides stored for use in the next growing season
2. Surplus pesticides returned to the dealer
3. Surplus pesticides applied for some other labeled use
4. Surplus pesticides diluted and sprayed over an isolated area
5. Surplus pesticides buried in an isolated area
6. Surplus pesticides burned or incinerated
7. Surplus pesticides disposed of in a landfill operation
8. Surplus pesticides disposed of by a commercial waste disposal company
9. Surplus pesticides disposed of in environmental, municipal or public drainage systems. Comments _____

Pesticide container disposal: Which of the following practices are used in disposal of pesticide containers? (circle all appropriate numbers)

1. Metal and plastic containers are decontaminated by the triple rinse or similar procedures
2. Combustible containers are burned on the premises
3. Containers are buried on the premises
4. Containers are disposed of in sanitary landfill facilities
5. Large containers are returned to the dealer or manufacturer
6. Containers are disposed of through barrel reclaimers, etc.
7. Containers are disposed of through commercial waste disposal companies
8. Containers are sometimes used for other purposes on the premises or by others off the premises
9. Containers accumulate on the premises
10. Containers are dumped at out-of-the-way places
11. Containers are stored for future disposal
12. Storage facilities for empty containers are similar to or the same as that for pesticide storage. Comments _____

On whom did you rely as the major source of pest control information for your operation in 1983? (check only one)

_____ Cooperative Extension Service
_____ Farm supply dealer
_____ State Department of Agriculture
_____ Media advertisements
_____ Chemical company sales representative
_____ Commercial pesticide applicator
_____ Crop consultants and/or scouts
_____ Yourself and past experience
_____ Neighbors or other producers
_____ Other (specify) _____

From the list above, what would you consider to be your secondary source for pest control information? _____

What was your cost for pest control in 1983?

	Cost for Self Application		Cost for Commercial Application	
	Pesticide Chemicals	Application Costs	Pesticide Chemicals	Application Costs
Insecticides				
Herbicides				
Fungicides				
Soil fumigation				
Animal, bird, etc.				
Other (specify)				
Total				

During 1983, how many people counting yourself, family members, employees and others were involved in farm operations of:

_____ Both mixing/loading and applying pesticides
_____ Only mixing/loading pesticides (exclude persons reported in A)
_____ Only applying pesticides (exclude persons reported in A and B)
_____ Estimated total percent of pesticides applied by commercial applicators

How would you rate your pest control program for 1983? (check the appropriate blanks)

	Insects	Weeds	Diseases	Other
Excellent				
Good				
Satisfactory				
Fair				
Poor				

APPENDIX 2

Glossary of Some Common Pesticides

Common Name	Trade Name
Fungicides	
Anilanzine	Dyrene
Benomyl	Benlate
Bordeaux	Bordeaux
Captafol	Difolatan
Captan	Captan, Orthocide, Merpan
Chlorothalonil	Bravo
Copper	Several, Kocide, Comac
Dichlone	Phygon, Quintar
Dinocap	Karathane
Dodine	Cyprex
Ferbam	Carbamate, Ferbam
Folpet	Phalton
Glyodin	Glyodin, Crag Fruit Fungicide
Lime sulfur	Lime sulfur
Mancozeb	Dithane M-45, Manzate-200
Maneb	Maneb, Manzate, Dithane M-22
Metiram	Polyram
PCNB	Terraclor
Streptomycin	Agrimycin, Agri-Strep
Sulfur	Several
Thiophanate-methyl	Topsin-M
Thiram	Thiram, AAtack, Arasen, Tersan, Others
Triadimefon	Bayleton
Triforine	Funginex
Triphenyltin hydroxide	Duter
Zineb	Zineb, Dithane Z-78, Aspor, Others
Herbicides	
Alachlor	Lasso
Atrazine	AAtrex, Atrazine
Bensulide	Prefar, Betasan
Bentazon	Basagran
Butylate	Sutan, Sutan +
CDAA	Randox
CDEC	Vegedex
Chloramben	Amiben
Chloroxuron	Tenoran
Chlorpropham	Chloro-IPC
Cyanazine	Bladex
Cycloate	Ro-Neet
2,4-D	2,4-D, Several
DCPA	Dacthal
Dalapon	Dowpon-M
Dinoseb	DNBP, Dinitro, Premerge, Sinox General
Diphenamid	Enid, Dymid
Diquat	Aquacide, Diquat
Diuron	Karmex, Diuron
EPTC	Eptam, Eradicane, Eradicane+
Glyphosate	Roundup
Linuron	Lorox
Metolachlor	Dual
Metribuzin	Sencor, Lexone
Napropamide	Devrinol
Naptalam	Alanap
Oryzalin	Surflan
Paraquat	Paraquat, Gramoxane, Ortho Paraquat CL
Pebulate	Tillam
Prometryn	Caparol
Pronamide	Kerb
Propachlor	Bexton, Ramrod
Pyrazon	Pyramin
Sethoxydim	Poast
Simazine	Princep
Terbacil	Sinbar
Trifluralin	Treflan
Insecticides	
Acephate	Orthene
Aldicarb	Temik
Amitraz	BAAM
Azinphosmethyl	Guthion
Bacillus thuringiensis (B.T.)	Dipel, Thuricide, B.T.
Carbaryl	Sevin
Carbofuran	Furadan
Carbophenothion	Trithion
Chlorpyrifos	Lorsban, Dursban
Cythexatin	Plictran, Acarstin
Demeton	Systox
Diazinon	Diazinon
Dicofol	Kelthane
Dimethoate	Cygon, Defend
Dinocap	Karathane
Disulfoton	Di-Syston
Endosulfan	Thiodan, Others
Ethion	Ethion, NIA 1240, Others
Fenbutatin-oxide	Vendex
Fenvalerate	Pydrin
Fonofos	Dyfonate
Formetanate-hydrochloride	Carzol
Isofenphos	Amaze
Lindane	Lindane
Malathion	Malathion, Cythion, Others
Methamidophos	Monitor
Methomyl	Lannate, Nudrin
Methoxychlor	Methoxychlor, Marlate
Methyl parathion	Penncap-M, Methyl Parathion, Several
Mevinphos	Phosdrin
Oil	Dormant Oil, Several
Oxamyl	Vydate
Oxydemeton-methyl	Metasystox-R
Parathion	Parathion, Niran, Phoskil, Thiophos, Several
Permethrin	Ambush, Pounce
Phorate	Thimet
Phosalone	Zolone
Phosmet	Imidan
Phosphamidon	Dimecron
Propargite	Omite
Rotenone	Rotenone
Terbufos	Counter
Tetradifon	Tedion
Trichlorfon	Dipterex
Other	
Daminozide	Alar
Ethephon	Ethrel
NAA	NAA, Naphthalene acetic acid
Silvex	Fruitone-t
Chloropicrin	Chlor-O-Pic, Acquinite
Mercaptodimethur	Mesurol
Methyl bromide	Brom-O-Gas, Dowfume, Meth-O-Gas
Zinc phosphate	Zinc Phosphate